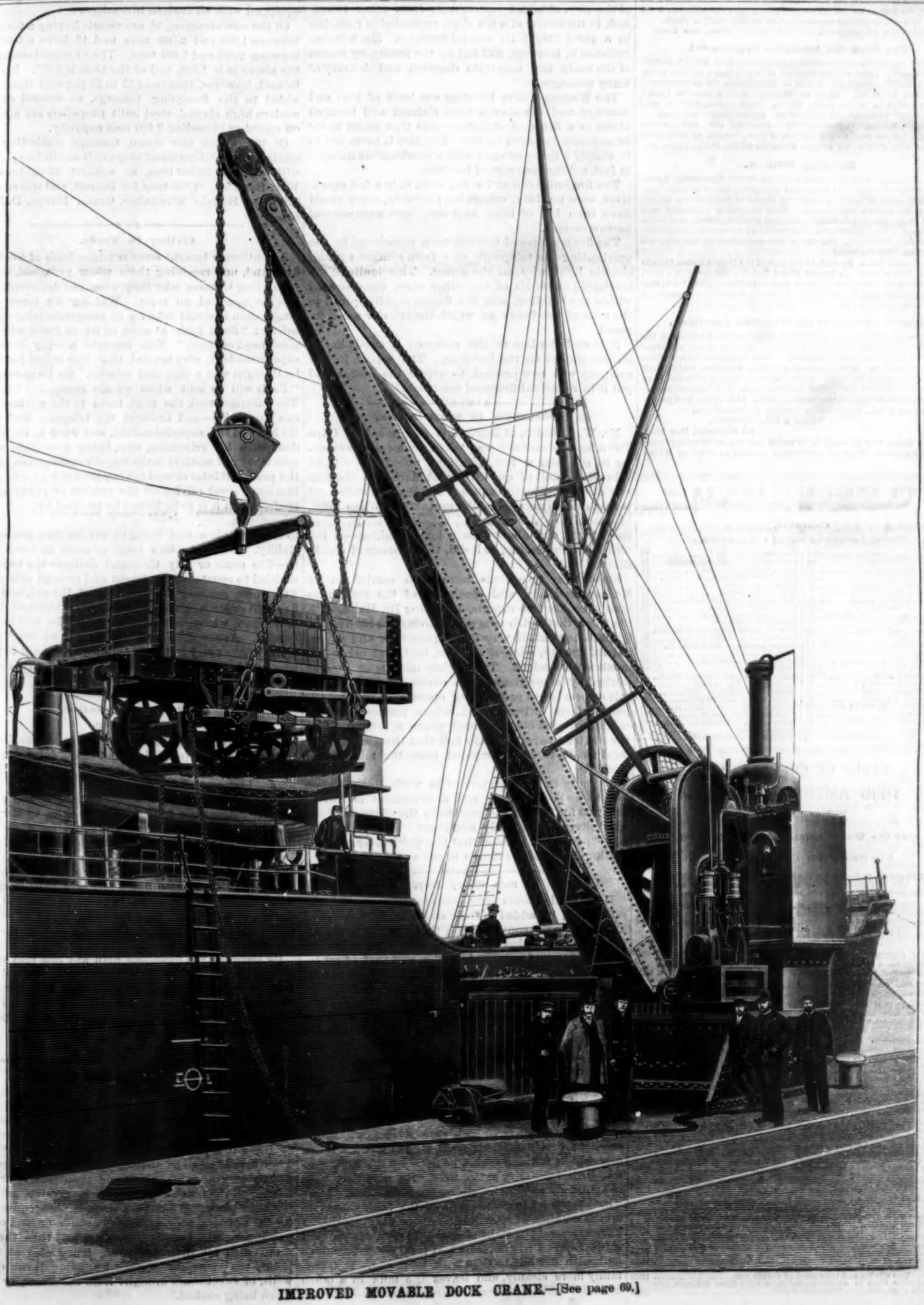
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1890, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIII.—No. 5. ESTABLISHED 1845. NEW YORK, AUGUST 2, 1890. $3.00 A YEAR. WEEKLY.



IMPROVED MOVABLE DOCK CRANE.—[See page 69.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico..... .....$3 00
One copy, six months, for the U. S., Canada or Mexico. 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *nine dollars* a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

NEW YORK, SATURDAY, AUGUST 2, 1890.

Contents.

(Illustrated articles are marked with an asterisk.)

Aparatus, slaughtering, electric*..... 68
Astronomy, $6,000 for..... 68
Atlantic, new route..... 73
Birch, the..... 69
Boiler, steam, Towle's*..... 67
Books and publications, new..... 75
Box, game, Fishel's*..... 66
Business and personal..... 74
Caps, fuse, fastener, Moodey's*..... 67
Cars, freight, mileage..... 72
Cement for iron railings..... 71
Civility in trade..... 64
Comet, Brooks I, 1890*..... 69
Construction, carelessness in..... 65
Copyrights, duration..... 69
Crane, dock, movable*..... 68, 69
Device, locking, bicycle, Wittig's*..... 66
Engine, steam, Robey's*..... 67
Engines, marine, improved..... 73
Fair, world's, Chicago*..... 70
Fever, yellow, homeopath on..... 68
Fire, telegraphic..... 64
Heater, improved, Knight's*..... 67
He will succeed..... 66
Houses, dwelling, Ladd's*..... 67
Inventions, index of..... 75
Inventions, recently patented..... 74
Lake, boiling, Nevada..... 72
Litigation, celluloid..... 72
Longevity, art of..... 73
Notes and queries..... 74
Ornaments, crystallized*..... 72
Party, lawn, electric..... 73
Patent—corn cob pipe..... 73
Planets in August..... 65
Power, water, and electric motors 73
Quicksilver in South Africa..... 64
Rabbit plague in Australia..... 65
Ram, hydraulic..... 69
Rust, iron, preventing..... 69
Salt every day..... 64
Shipbuilding, American, revival.. 64
Snake, bow, climbs tree..... 69
Speed, high rates of..... 73
Table, folding, Moan's*..... 66
Telegram, delayed..... 66
Traveling, unpleasant..... 64
Turpentine, to rectify..... 64
Venus, planet..... 68
Wash boiler, improved*..... 67

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 761.

For the Week Ending August 2, 1890.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ASTRONOMY.—Heliostat for the Smithsonian Institution, Washington.—By Sir. HOWARD GRUBB.—A recent accession to the cabinet of the Smithsonian Institution..... 12151

II. CHEMISTRY.—A Cheap Funnel Jacket.—By JOHN A. FORREST. —A simple and easily constructed laboratory appliance for filtering solutions hot.—1 illustration..... 12156
Wilcox's Method for the Analysis of Sulphur in Iron and Steel.—By J. B. COHEN, Ph.D.—A colorimetric method of determining sulphur in iron and steel.—1 illustration..... 12156

III. CIVIL ENGINEERING.—Some Engineering Works.—By E. L. CORTHELL.—A review of some of the great engineering works of the century, with interesting statistics and data..... 12152

IV. CYCLING.—A Water Velocipede.—A water bicycle with concealed motor.—1 illustration..... 12155

V. DECORATIVE ART.—The Use of Alloys in Art Metal Work.—By Prof. W. C. ROBERTS-AUSTEN.—An elegant series of examples of Japanese art work in metals of different colors with analyses and full details.—12 illustrations..... 12162

VI. ELECTRICITY.—A "Home-made" Electric Motor.—A motor for driving a sewing machine fully described, with full sized illustrations of parts.—12 illustrations..... 12160
An Experimental Proof of Ohm's Law, Preceded by a Short Account of the Discovery and Subsequent Verification of the Law.—By ALFRED M. MAYER.—An excellent demonstration for the use of the student of the great electric law.—3 illustrations.... 12162
Electric Torch at the Paris Opera House.—Recent application of electricity at the Paris Opera House, in illuminating the torch of Genius.—2 illustrations..... 12160

VII. MECHANICAL ENGINEERING.—An All-round Titan.—A lifting crane of very great power and capacity for use in railroads, track yards, and in similar positions.—1 illustration..... 12155
Sibley College Lectures.—Car Wheels.—By ROBERT W. HUNT.—A Sibley College lecture, treating of the manufacture of cast iron car wheels and the processes for producing a good wearing surface for the tread.—4 illustrations..... 12158

VIII. MISCELLANEOUS.—Heligoland.—Description of the island recently ceded to Germany by England..... 12159

IX. NAVAL ENGINEERING.—The Large Sail Vessels of France.—The increase in size of iron sailing vessels, with description of the largest sailing vessel in the world.—Advantages of water ballast. —3 illustrations..... 12154

X. TECHNOLOGY.—Improved Flax Scutching Machine.—An advance in the manufacture of linen.—A new Scotch machine for treating the stalks of flax.—3 illustrations..... 12159
Note on Artificial Ivory..... 12156
The Great Salt Deposits of Khewra, in the Punjab.—By E. RODGERS.—The mining and treatment of Indian salt..... 12153
Sulphite Pulp in America.—Sulphite pulp from different processes compared, and difference stated..... 12159

A TELEGRAPHIC FIRE.

The headquarters of the Western Union Telegraph Company, 195 Broadway, corner of Dey Street, were greatly injured by fire on the morning of July 18. The chief operating room, with its grand array of instruments, simplex, quadruplex, and many other kinds, operatively connected with thousands of wires, leading to all parts of the world, were almost instantly destroyed, and the telegraphic communication of the country interrupted and disorganized. The effect upon business and domestic affairs was like a stroke of paralysis.

The company, with commendable activity, proceeded to secure temporary quarters in various parts of the city, obtained instruments from other towns, and, in the course of a few days, succeeded in restoring to a great extent its normal facilities. Much inconvenience is, however, still felt by the public, by reason of the tardy and uncertain dispatch and delivery of many messages.

The Western Union building was built of iron and masonry, and has always been claimed and bragged about as a fireproof structure—one that could never be seriously damaged by fire. But now it turns out to be simply a fireproof shell with a combustible lining—in fact, a dangerous sort of building.

The fire broke out at 7 a. m., when only a few operatives were on duty, otherwise, probably, there would have been loss of life. As it was, there were several narrow escapes.

The fire is supposed to have been occasioned by the overheating of a telegraph wire from contact with an electric light wire on the street. This ignited the insulating materials of the other wires concentrated within the building, and the flames rapidly spread to the mass of woodwork of which the interior was composed.

It is said the loss to the company is about half a million dollars on the building. The report is, the company will now proceed to repair the edifice, and put it in an actual fireproof condition.

Quicksilver in South Africa.

Mr. W. J. Smith, of Zeerust, is at present in Cape Town, and advantage was taken by an *Argus* reporter to ask him a few questions about the alleged valuable deposit of quicksilver at Marico, in the Zeerust district. The substance of Mr. Smith's statement is that some time ago, while inspecting Witkop farm, his attention was attracted by a peculiar formation of rocks there, and also by the color—vermilion—of the rock itself, indicating, as it did, the presence of quicksilver.

Since then operations have been carried on by Mr. Lemmert, Jr., and specimens of the rock have been submitted to experts, including Dr. Hahn, with the result that a rich mineral discovery has been made. Quicksilver exists in very large quantities and of excellent quality, while silver, zinc, lead, and other minerals are abundant. The Witkop mine is at present worked by a syndicate with successful results; and this success led to prospecting operations on the adjoining farm of Buffelshoek, where precisely similar conditions were observed, and where a scratching of the surface has revealed the fact that there are equally good results to be anticipated from the mine being worked.

A syndicate has been formed to work this mine as well as that of Witkop; and a movement is also in progress for further exploration in the district, where quicksilver is evidently abundant. Professor Hahn has expressed an opinion that the quicksilver mine at Witkop is one of the richest in the world.

Salt Every Day.

Dairy cattle should have access to salt every day, and salt should be added to their stable feed. A series of experiments has convinced me that when cows are denied salt for a period of even one week they will yield from 14½ to 17½ per cent less milk, and that of an inferior quality. Such milk will on an average turn sour in twenty-four hours less time than milk drawn from the same or similar cows receiving salt, all other conditions of treatment being equal. Comfortable quarters are indispensable to the health and well-being of cows. Stables during the winter should have a temperature constantly within the range of 40 to 55 degrees Fah. In summer time a shade should be provided in the pasture fields or adjacent thereto to protest against the bristle-making influence of July and August suns. In all the management of cows such conditions should be provided and such care given as will insure excellent health and apparent contentment. When practicable, milking should be done by the same person, with regularity as to time. He only that hath clean hands should be allowed to milk a cow. I say "he" because I think the men of the farm should do all the milking, at least during the winter months. I have exercised the right of changing my mind on that subject since I left the farm. It is no more difficult to milk with dry hands than with them wet. It is certainly more cleanly, and leaves the milk in a much more desirable condition for table use or manufacture. Pure stable atmosphere is indispensable to prevent contamination from that source. Immediate straining will remove impurities which otherwise might be dissolved, to the permanent injury of the whole product. —*Orange Judd.*

Revival of American Ship Building.

According to the *Marine Record*, the new tonnage of the first six months of the present year is represented by 79 steam vessels, with a tonnage of 63,922, and 30 sailing and tow vessels with a gross tonnage of 15,559, making a total of 109 vessels having a gross measurement tonnage of 79,481 tons, including steel, iron, composite and wooden vessels of first class design and equipped with all modern inventions.

Of the new steamers, 18 are vessels having a tonnage between 1,000 and 2,000 tons, and 13 have a tonnage between 2,000 and 3,000 tons. The average tonnage of the above 18 is 1,609, and of the 13 it is 2,307. It must be said, however, that from 15 to 35 per cent should be added to the foregoing tonnage, as several of the modern high classed, steel built propellers are already on record as exceeding 3,000 tons capacity.

Of the above new steam tonnage (excluding the smaller vessels), Cleveland shipyards are to be credited with at least 30,000 tons, as against 12,000 tons for West Bay City, 11,000 tons for Detroit, and still smaller totals for Buffalo, Milwaukee, Grand Haven, Duluth, etc.

Civility in Trade.

A gentleman bought some machine tools of a certain firm, and, not receiving them when promised, wrote, requesting to know why they were not delivered. To this he received no reply. Waiting for three days longer than it would take for an answer, he telegraphed briefly: "Send tools at once, or let us know why; in great need of them." This brought a reply from the superintendent, who fancied that this called for what he thought was a dignified rebuke. So he answered: "Tools will be sent when we are ready, not before." The customer took the next train to the works—only one hour's ride—and brought the telegram with him. He ignored the superintendent, and went to the president with his grievance, who, being a sensible man, soon arranged matters to the buyer's satisfaction. Then the president interviewed the superintendent, and gave him some good advice on the subject of politeness in trade, which it is to be hoped he profited by.

Human nature is weak, and the best of us are liable to err, but it is a bad thing to err on the side of incivility. No matter how large or small an order may be—five cents or fifty thousand dollars—the buyer is entitled to courteous treatment and prompt attention. The mouse gnawed the lion free of the net, and the five cent order man may know a fifty thousand dollar order man, whom he will take where he will be well treated. As the *Engineer*, from which we copy, says, civility pays every time. It is a cardinal point in business, and boors should remember that rudeness always recoils upon those who exhibit it.

To Rectify Turpentine.

CHARLES C. PARIS.

As it is difficult to obtain nice, clear turpentine for microscopical purposes, I want to give other workers the benefit of my experience in rectifying the ordinary fluid. I proceed as follows:

Take one pint of the common turpentine and mix in a quart bottle with four fluid ounces of 98 per cent alcohol. Agitate well, and let stand until the two fluids separate. Decant the turpentine (which will form the lower layer) from the alcohol, and mix it with one pint of clear water. Agitate thoroughly, and let stand until these two fluids separate, then from the water decant the turpentine (which this time will form the upper layer), and, finally, mix with the turpentine about one ounce of powdered starch, and filter through paper.

By pursuing the foregoing plan any one may secure a pure, limpid, and brilliant turpentine. The alcohol used in rectifying it need not be wasted, as it will do to burn, to clean slides, or for other purposes. I usually make a large quantity and recover the alcohol by distillation.—*The Microscope.*

Where Traveling is not Altogether Pleasant.

Travelers on the Eastern Bengal Railway have placed before their eyes on entering the stations of the road a placard containing the following cheerful information: "Passengers are hereby cautioned against taking anything to eat or drink from unknown persons, as there are many who live by poisoning travelers. They first of all court acquaintance with passengers in a *sarai* or some other place, and then gain their confidence on the plea of being fellow travelers going to the same place. When they reach a place convenient for the purpose, they poison the water or food of the passengers, who become insensible, and then they decamp with all their property. They also at times poison the passengers' water when being drawn out of wells, or sweetmeats brought from the bazar, or food when being cooked."

POSITION OF THE PLANETS IN AUGUST.

JUPITER

is evening star. He retains his place as first on the list during August, but when the month closes, he loses his pre-eminence, for the splendor of his fair rival in the west equals if it does not exceed his own. He will, however, at the close of the month be near the meridian when Venus sets, and shine brightly for hours after she has disappeared below the western horizon. The bright star on the southeast of Jupiter is Fomalhaut, the bright star on the northwest is Altair. Observers will note how much larger and more brilliant Jupiter is than either of these first magnitude stars.

Jupiter sets on the 1st at 4 h. 41 m. A. M. On the 31st, he sets at 2 h. 25 m. A. M. His diameter on the 1st is 46".2, and he is in the constellation Capricornus.

VENUS

is evening star. She shines with increasing luster as she makes her way toward the earth, becoming visible soon after sunset, and continuing above the horizon for about two hours. Her diameter at the close of the month is twice as large as it was at superior conjunction. When seen in the telescope, she takes on the gibbous phase, like that of the moon passing from the full to the last quarter. This beautiful planet is near Spica on the 30th, passing 1° north of the star. Observers will note her rapid movement southward. She passes during the month from 4° 53′ north declination to 10° 14′ south declination.

Venus sets on the 1st at 8 h. 55 m. P. M. On the 31st, she sets at 8 h. 4 m. P. M. Her diameter on the 1st is 15".8, and she is in the constellation Leo.

MERCURY

is evening star. As he moves eastward from the sun, he encounters Saturn moving westward toward the sun. The planets are in conjunction, on the 9th, at 11 h. 56 m. P. M., Mercury being 34′ south. They are both too near the sun to be visible.

Mercury sets on the 1st at 7 h. 46 m. P. M. On the 31st, he sets at 7 h. 18 m. P. M. His diameter on the 1st is 5".0, and he is in the constellation Leo.

MARS

is evening star. He is in conjunction with Antares on the 14th, passing 1° 25′ north of the star he so closely resembles. Observers will note the approach of Mars and Jupiter, as well as the decreasing luster of the ruddy planet.

Mars sets on the 1st at 11 h. 44 m. P. M. On the 31st, he sets at 10 h. 38 m. P. M. His diameter on the 1st is 15".0, and he is in the constellation Scorpio.

SATURN

is evening star until the 30th and then he becomes morning star. He is in conjunction with the sun on the 30th at 2 h. P. M., and is of little account during the month, being too near the sun to be visible.

Saturn sets on the 1st at 8 h. 21 m. P. M. On the 31st, he rises at 5 h. 17 m. A. M. His diameter on the 1st is 15".4, and he is the constellation Leo.

NEPTUNE

is morning star. He is in quadrature with the sun on the 30th at 1 h. A. M.

Neptune rises on the 1st at 0 h. 20 m. A. M. On the 31st, he rises at 10 h. 21 m. P. M. His diameter on the 1st is 2".6, and he is in the constellation Taurus.

URANUS

is evening star. He sets on the 1st at 10 h. 11 m. P. M. On the 31st he sets at 8 h. 15 m. P. M. His diameter on the 1st is 3".5, and he is in the constellation Virgo.

Mercury, Venus, Uranus, Mars, and Jupiter are evening stars at the close of the month. Saturn and Neptune are morning stars.

Copyrights in Different Countries.

The duration of copyrights in various countries, according to a *resume* given some months ago by a writer in the *Westminster Review*, is as follows: In *Greece* the period during which an author can hold a copyright is restricted to fifteen years; and the writer indicates his estimate of the limitation in a business point of view by saying that the modern Greeks thus justify their reputation as the most acute of business men. The *Swiss* grant copyright during the life of the author or his heirs during thirty years from the date of publication of his work. His heirs can have a copyright in his posthumous work for thirty years from the date of his death, if they publish the works within ten years of his decease. In the *United States* copyright is accorded to authors during twenty-eight years from the time when the title is recorded, and for fourteen years more if the author, or certain representatives of the author, be living, and if the title of the work in question be recorded anew within six months before the expiration of the twenty-eight years—the period during which the copyright was already secured. In *Japan* the ordinary copyright is accorded for thirty years; but fifteen years may be added to that period in favor of works of great utility. According to *English* law, authors enjoy a copyright for a term of forty-two years from the date of publication of the work, or during the life of the author and seven years from the date of his death, whichever may be the longer. In *Brazil* the author enjoys a copyright for life, and it is extended for ten years after his death. In *Venezuela* the copyright endures for the life of the author, and fourteen years after his death. In *Holland* and *Belgium* the copyright lasts during the life of the author, and during twenty years after his death. In *Germany*, *Austria Hungary* and *Portugal* copyright endures during the life of the author, and during thirty years after his death. The duration of copyright in *Italy* is regulated in a peculiar manner. It endures for the life of the author and forty years after his death, or for eighty years after the publication of the work; the term of years being divided into two periods of forty years each. If the author dies within the first period of forty years, the remainder of the term is enjoyed by his heirs or assigns. The second period of forty years begins at the death of the author, if he has died after the first period of forty years has elapsed; or if he has died before then, at the end of the first period of forty years. During the second period any one is at liberty to republish the work on payment to the owner of the copyright of a royalty of five per cent on the price, which must be marked on the book. *France*, *Norway*, *Sweden* and *Denmark* accord a copyright during the life of the author and during fifty years after his death. *Russia* not only gives copyright for life and during fifty years after, but also for ten additional years if an edition of the work is published within five years from the end of the first copyright term. The law of *Spain* accords a copyright during the life of the author, and for eighty years thereafter. Only in *Mexico* is copyright perpetual.

Carelessness in Construction.

If men persist in running the ends of floor beams into the flues of chimneys and leaving them so, out of sheer laziness or besotted stupidity, says the *Independent*, it must be expected that houses so built will take fire. If apartment houses are built with a wooden box from cellar to roof, kiln dried in course of time, with temptations added in the use of matches and hot coals, the house will be on fire from cellar to roof in a flash, if the start of a little fire comes, whether the first week or the thousandth. If people build, and other people occupy, such a dwelling in the cellar of which a baker fries crullers in hot fat before daybreak in the morning, just as soon as the slipping of the baker's foot or some other little slip spills the fat on the fire the whole structure will be in a roar of flame, although there may be a hundred little children dreaming in their cribs on every floor. If builders run up a church wall and leave it unsupported by floor beams or shoring, and a heavy gale comes, the wall will crash down on a dwelling alongside. The intention, the plan, the forethought or lack of forethought, are all immaterial. The poison does not observe it has been swallowed by mistake, and therefore omit to attack the stomach in the way natural to it. It is the act, and not the motive, which determines results. And if a tinder box shaft is put into a building, or if there is a furnace flue placed too near the wood, these things act precisely as if they had been planned to set buildings on fire as soon as they are brought into the right conditions, and if there are open air spaces, and connecting within walls and under floors and roofs—as there are in all buildings except perhaps one in ten thousand—the fire goes through those spaces to the top as readily and certainly as if they had been planned to be the flues they really are.

Then when the train which bad building and bad habits have laid goes off and the fire breaks out we run and bring a fire department maintained at a heavy cost, which stops the burning with a water damage second only to that of the fire, then we look to the insurance companies and consider that there is no real loss if only we have been "covered."

Now just as long as these bad habits continue, fires and all the list of preventable calamities will follow them. That these reckless ways will continue indefinitely is not to be expected—they are too costly, their cost will compel reform. But is it not time to seriously undertake the reform and stop the cost from running up further?

Six Thousand Dollars for Astronomical Discoveries.

Miss C. W. Bruce offers the sum of six thousand dollars during the present year in aiding astronomical research. No restriction will be made likely to limit the usefulness of this gift. In the hope of making it of the greatest benefit to science, the entire sum will be divided, and in general the amount devoted to a single object will not exceed five hundred dollars. Precedence will be given to institutions and individuals whose work is already known through their publications, also to those cases which cannot otherwise be provided for, or where additional sums can be secured if a part of the cost is furnished. Applications are invited from astronomers of all countries, and should be made to Professor Edward C. Pickering, Harvard College Observatory, Cambridge, Mass., before October 1, 1890, giving complete information regarding the desired objects. Applications not acted on favorably will be regarded as confidential. The unrestricted character of this gift should insure many important results to science, if judiciously expended. In that case it is hoped that others will be encouraged to follow this example, and that eventually it may lead to securing the needed means for any astronomer who could so use it as to make a real advance in astronomical science.—*Science*.

The Rabbit Plague in Australasia.

A recent report by the United States consul at Sydney, N. S. W., gives a vivid idea of the extent of the rabbit pest in Australia. The extraordinary fecundity of the animals under the climatic conditions there prevailing have caused the country to be completely overrun with them. Vast regions are devastated, and the grass and other herbage is devoured. The government has spent immense sums to destroy and repress them. New South Wales has spent nearly $4,000,000. Several thousand miles of wire fencing has been erected, and large amounts in bounties for scalps have been paid. The bounty has varied from two cents a scalp to twenty-four cents, according to the number of rabbits in the district. The rabbit hunters have earned from $20 up to $50 a week. The natural consequence has been that the extermination of rabbits has been the last thing desired by some of these rabbit hunters, and the bounty began to take the form of a practical subsidy or protection for the very animals it was desired to destroy. The employment of the rabbit hunters was made compulsory on the owners of land. The determination has at last been reached to discontinue the payment of such bounties.

Wire fencing has been found of use. A height of 3 feet, with 1½ mesh and No. 17 wire, has been found effective in excluding them. A wooden picket fence is also noted as giving good results.

The figure of five millions is given as the possible increase of two pairs of rabbits in three years. Yet even this is a low estimate of the possibilities of reproduction of rabbits. The average life of a rabbit is put at about nine years. The doe may have young eight times in a year, averaging eight each time. The first litter is produced when but four months old. The progressions based on these figures lead to astonishing results. For three years the possible progeny of two rabbits has been calculated as over thirteen millions, and for seven years as fifteen hundred millions. Of course these estimates may exceed reality, but they indicate the impossibility of killing off the foreign invader. Fifteen million skins have been exported from New South Wales in one year, yet the rabbits are not diminished. The climate of Australia seems to be such that no extraneous limit is placed to their propagation. In other lands they do not increase to any extent, and in settled places often become extinct. Instances of their destructive power are only too frequent in the antipodes. At a place called Terganynia, in 1889, 60,000 acres of grass were destroyed by them, although a million were killed on this identical tract.

At present the southwestern part of the continent is most afflicted. Curiously enough, tame rabbits will not spread. In the early history of the country they were introduced, but did not thrive. The origin of the present evil is traced to a single pair of wild brown rabbits liberated in Victoria. The first enactments against them were passed in 1879.

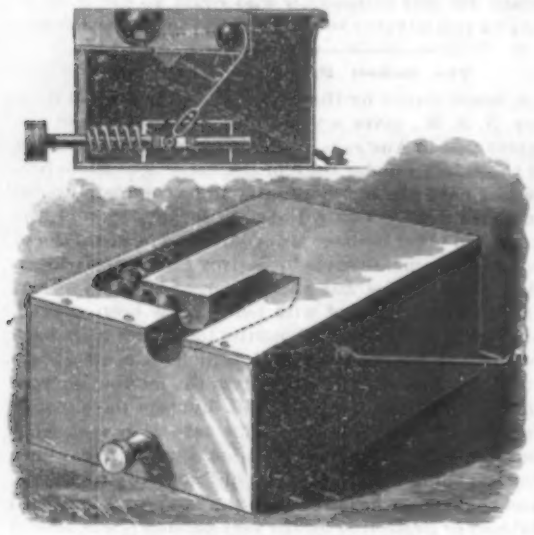
While their destruction would seem hopeless, in view not only of the figures given above, but an account of the experience of the past decade, attempts are still in progress. Poisoning is extensively used, of course unfitting the animals for food. This is held to be an advantage, as any utilization of the animal is in the line of opposition to its extermination. It is largely on account of poisoning that many canning factories started to utilize rabbits as a food product have been abandoned. Ferrets are found useful, but they have already done much harm to poultry and some of the interesting indigenous birds. Traps that kill the rabbits kill ferrets also, so the use of wire pounds to capture them in quantities alive is advised.

It will be remembered that a reward was offered by the government of New South Wales for a method for the destruction of rabbits. Up to the end of last year about 1,500 methods had been proposed and examined, but none answered the requirements. No less than 115 were for the destruction by disease. One curious scheme consisted in the killing of the females and letting the males escape. This, it is claimed, will bring about a preponderance of the males, who will worry the females to death. This plan is actually under trial now.

M. Pasteur, the eminent French biologist, proposed to introduce chicken cholera by inoculation. He reserved as his secret the method of preparing the virus, which secret he agreed to divulge only if the reward was given him. The method was tried most carefully under the superintendence of M. Pasteur's own assistants. Rodd Island, near Sydney, was chosen for the work. The commission reported adversely, holding that practically the virus was little or no better than arsenic or other known poison. Thus the reward of $25,000 remains in abeyance, while the rabbits continue to be as bad a plague as ever.

A NOVEL TOY.

The game box shown in the accompanying illustration is designed to afford amusement for young and old. It has been patented by Mr. Charles W. Fishel, of Carbondale, Col. The cover is hinged at one end



FISHEL'S TOY OR GAME BOX.

and fastened with screws at the other end, and has a longitudinal groove slightly slanting downward toward the center; this groove being intersected by another groove having a turn. In the latter groove is a projection to prevent the marbles rolling into the end groove by gravity, and in this end groove is a longitudinal slot with a enlarged portion through which projects a lever which turns on a fixed pivot, and is pivoted at its lower extremity to a rod projecting through an opening in the front of the box. This rod is surrounded by a spiral spring which serves to force the rod outward after it has been pushed in. The pushing in of the rod releases a marble from the angled groove, and the marble falls into the main groove in front of the lever. Now, by striking smartly on the button at the end of the rod, the lever will be instantly moved forward, and the marble in front of it will be projected with great velocity. At the same time an arm, not shown in the drawing, pushes another marble over the obstruction in the angled groove ready to be discharged into the main groove, when the apparatus will be ready for another shot.

The box is anchored as shown in the engraving. It is obvious that a variety of games may be adapted to this apparatus.

NEW FOLDING TABLE.

In the annexed engraving is shown a folding table which is designed to be used as an ordinary table, and also as a pedestal for the use of undertakers for supporting coffins and caskets.

The table top is provided with a cruciform groove, to which are fitted the upper ends of the table legs. The upper and lower ends of the legs near their adjacent sides are provided with slotted straps, as shown in the detached plan view, which hold the parts in proper relation to each other, whether the table is folded or arranged for use.

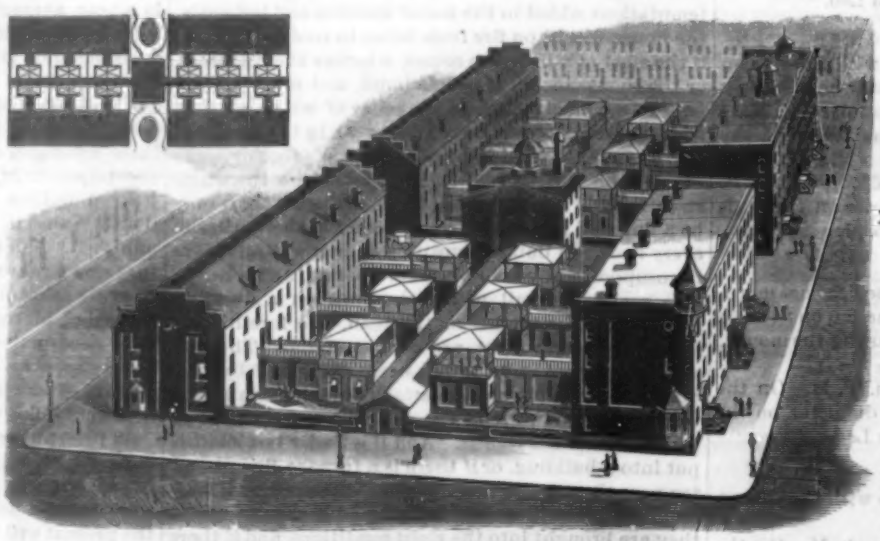
When the table top is removed the legs are folded together, as shown in the lower view, and held in this position by the slotted straps and by a hook attached to the first of the series of legs and an eye inserted in the last. When the table is arranged for use it is very strong and capable of supporting considerable weight. When it is knocked down it is very compact, and may, therefore, be readily packed for storage or shipment.

This invention was recently patented by Mr. W. J. Moan, No. 145 India Street, Brooklyn, E. D., N. Y.

MOAN'S FOLDING TABLE.

IMPROVED DWELLING HOUSES.

The illustration represents a model plan, recently patented by Mr. Leonard E. Ladd, of No. 2144 Mount Vernon Street, Philadelphia, for the building of improved dwelling houses. The plan provides for the erection of a block of buildings, and their connection in such way that the ordinary kitchen work and general supply features will all be cared for in one central building, the illustration showing twenty-four houses laid out after such a scheme, although the system would be equally applicable to at least as many as forty houses. As the average distance through the supply hall for forty houses 18 feet front would only be about 90 feet, the houses proper would admit of more than the usual variety of construction and interior arrangement, from the fact that the kitchen and dining room would not be in them, thus leaving more room for other purposes. From the rear of the ground floor a covered passageway or hall leads to a back building of sufficient size for the dining room, this building being preferably only one story in height, with a tent-like or canopy cover, to form a pleasant place to sit in favorable weather and to protect room from heat of the sun. From the dining rooms of all the buildings in the block a covered passageway or general supply hall extends to a central building, to be used as a common supply building, laundry, and kitchen, and fitted up with appliances for furnishing light and heat, room for servants' quarters, etc. When electric light is used, the dynamos would be located in this building, as also the plant for supplying heat, and the blowers for artificial ventilation, and cold storage, if this was desired. This central building would preferably be connected with each of the houses in the block by a speaking



LADD'S IMPROVEMENTS IN DWELLING HOUSES.

tube or by telephone, whereby the housekeeper could order supplies in advance for each successive meal, the superintendent of the general supply building thus having the opportunity to buy in larger quantities, and better suit individual tastes, according to the larger number to be served. Not only would all the food thus be served without the smell of cooking in the house, and the dishes removed, but there would be no laundry work in the house, no stocking of coal bins and no care of furnaces, with the many other cares incident to ordinary housekeeping, but the readiness of service, under proper regulation, would be vastly superior to that at present realized in most of what may be styled the "best regulated families." The plan of heating is far superior to covering the pipes in the ground, and the distance to carry it will be so short, all condensed steam can return to the boiler hot (if heated with steam), which will be a great saving.

NEW LOCKING ATTACHMENT FOR BICYCLES.

The advantage of being able to lock the steering gear of a bicycle in a fixed position, when it is desired to lean the machine against a building, fence, or other support, will be appreciated by every bicyclist. The improvement which we illustrate is applicable to any style of bicycle, whether provided with a central steering head or not. The engraving shows in one view a bicycle provided with the improvement leaning against a support, while the other view shows the parts enlarged and partly in section.

The bicycle frame is provided with a sleeve in the usual way, which contains the upper end of the shank of the steering wheel fork. Upon the sleeve is secured a perforated segmental plate, and to the shank are attached perforated arms, which receive a bolt adapted to enter the holes of the segmental plate. Between a collar on the bolt and the arm above it is placed a spiral spring, which tends to press the bolt downward. In a slot in the upper end of the bolt is pivoted a lever having a shoulder which rests upon a bar extending across the aperture in which the bolt slides, and through the slot of the bolt. This lever is adapted

WITTLIG'S LOCKING DEVICE FOR BICYCLES.

to lift the bolt and hold it in an elevated position, so as to permit of freely moving the bicycle fork.

When it is desired to lock the fork and the steering wheel in a fixed position, the bolt is released by turning down the shouldered lever, when the spring will force the bolt into the aperture of the segmental plate, and thus lock the steering apparatus in a fixed position.

This device can be operated in an instant. It may be made light, and there is no danger of its being broken, as the collar on the head will turn before the bolt can be overstrained. The attachment adds to the appearance of the machine, and is, withal, very useful and desirable.

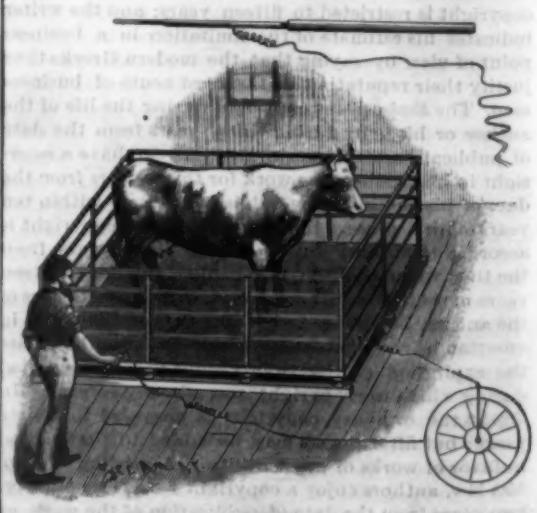
This invention has been patented by Mr. Fred E. Wittlig, of Marietta, Ohio.

ELECTRIC SLAUGHTERING APPARATUS.

The inventors of the slaughtering apparatus shown in the engraving have found by experiment that their method of killing animals by means of a high tension electrical current is less cruel and barbarous than the ordinary method. They also find that the animal bleeds more freely, and that the meat is benefited by the passage through it of an electric current. The inventors state that meat slaughtered by this method will keep longer than by other methods, and that pork slaughtered by electricity is found to be entirely free from trichinæ.

The apparatus consists in a pen provided with a metallic floor divided into two sections, an electric generator for supplying a current of sufficiently high tension for the purpose, and a hand electrode for applying the current to the animal. The pen rests upon insulators, and one portion of the metallic floor is connected with the dynamo, which is represented diagrammatically in the engraving.

The animal to be killed is first driven through a shallow pool of water to wet its hoofs, so as to secure a good electrical contact with the sections of the metallic floor. When the animal stands partly upon each section, it may be killed by bringing the electrode into contact with the rear part of the floor, thereby causing



MILLER & DOFFLEMYRE'S SLAUGHTERING APPARATUS.

a current in the dynamo to flow through the electrode, through the rear part of the floor, and through the animal to the front part of the metallic floor, thence back to the dynamo.

If desired, the killing may be effected by the direct application of the electrode to the head of the animal.

Messrs. J. D. Miller and James A. Doffiemyre, of Gunnison, Colorado, are the inventors of the apparatus.

INSTRUMENT FOR FASTENING FUSE CAPS.

A new implement for fastening caps on giant powder fuse has been patented by Mr. Nathan W. Moodey,

MOODEY'S FUSE CAP FASTENER.

of Fresno City, Cal. This implement is made in the general form of pliers. It is formed of two similar parts connected together by a pivotal rivet. Each part has a curved handle, and with a cheek having notches with cutting edges at the sides of the notches. Upon the edges of the cheek pieces opposite the handles are formed curved jaws which, when closed together, form a circular aperture for receiving the fuse cap.

The jaws are beveled on opposite sides around the aperture. One jaw is provided with a tongue which fits into a corresponding groove in the other jaw.

The pliers are used for cutting fuse and for contracting the end of the cap on the fuse. They are well adapted to the purpose for which they were designed, and will doubtless speedily find their way into the kits of users of fuse and fuse caps.

NEW WASH BOILER.

A wash boiler in which the articles to be washed may be separated, so that they may be readily sorted and classified, is shown in the annexed engraving. Each lot of articles is separately boiled or steamed and rinsed in one general receptacle. The apparatus may also be used with equal facility in bleaching.

The body or outer portion of the device is a metal vessel having a faucet at the bottom for drawing off the contents, and provided with a suitable cover furnished with a groove for receiving the apertured edge of the vessel. This vessel is divided into a series of compartments by transverse and longitudinal corrugated partitions, the partitions being attached to the inner walls of the vessel. These partitions may be either fixed or removable as circumstances may require. Within each compartment thus formed is placed a perforated bottom, and to each compartment is loosely fitted a bucket furnished with a perforated bottom and a bail for convenience in lifting it out of the boiler.

In the operation of washing, the chamber in the lower part of the vessel is nearly filled with water, and the clothes are sorted and placed in the different buckets, and the buckets are lowered into their respective compartments in the boiler. As soon as the water in the lower part of the vessel boils, it is forced by steam pressure upward between the partitions, the linings of the vessel and the buckets, and flows into the buckets, returning through the clothes by gravity, carrying with it the dirt loosened by the action of the hot water and the steam. This operation goes on continuously so long as the boiling point is maintained.

It is claimed that the clothes are not actually boiled, but that the dirt contained in the fabrics is softened by the action of the steam, and is removed by the circulation of the boiling water. As soon as this operation is complete, the different buckets may be removed and placed in another similar vessel for rinsing, or they may be rinsed in the usual manner, each class by itself.

For further information regarding this invention address Mrs. Mary White, 1541 Broadway, N. Y. City.

MRS. MARTINOT'S IMPROVED WASH BOILER.

NOVEL STEAM ENGINE.

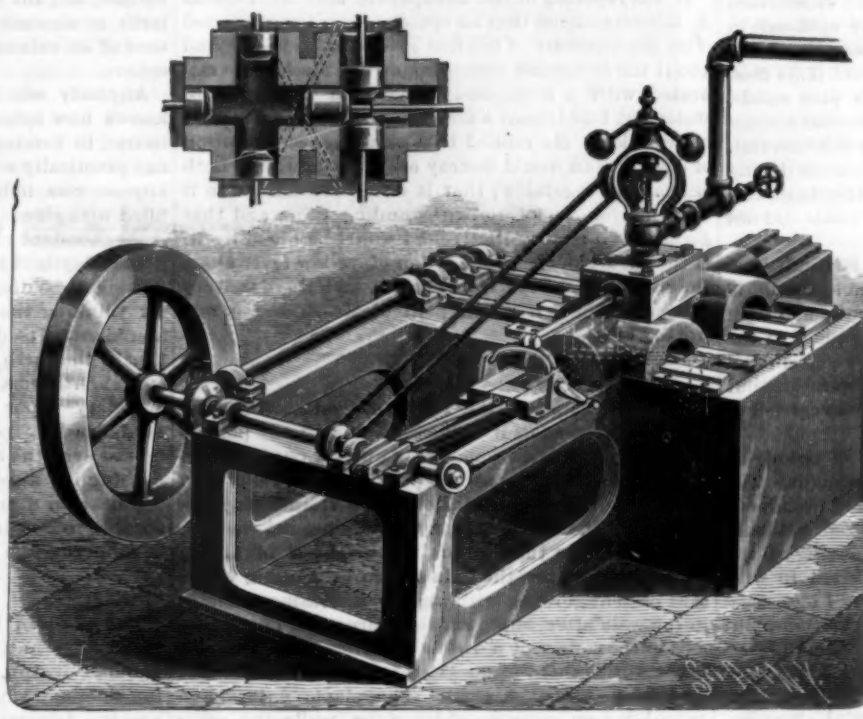
In the engine shown in the annexed engraving, the inventor has provided a mechanism for utilizing the steam to the fullest extent. This engine is practically furnished with four pairs of reciprocating pistons, although in reality one of the pistons answers a double purpose. The power cylinder consists of a longitudinal cylinder intersected by two transverse cylinders. In the longitudinal cylinder are arranged three pistons, two pistons being placed in opposite ends of the cylinder and connected by a rigid bar outside of the cylinder, the third one being placed in the center division of the cylinder. The central piston and the end pistons are connected with oppositely arranged cranks on the main shaft, so that the end and central pistons move simultaneously in opposite directions.

Transverse cylinders are located at points corresponding to the ends of the strokes of these pistons, and in each transverse cylinder are arranged pistons which move simultaneously in opposite directions, and their movements are so timed relative to the pistons in the main cylinder that when the pistons in the main cylinder approach the point of intersection, the pistons in the transverse cylinders approach in like manner, and the movement of the pistons in the opposite direction are also in unison.

An auxiliary shaft is arranged at right angles with the main shaft, and connected therewith by a miter gearing. The auxiliary shaft is provided with two oppositely arranged cranks, which are connected with the crossheads of the piston rods of the adjacent pistons of the transverse cylinder, and these crossheads are connected by rods running underneath the cylinder with the diagonally opposite pistons in the transverse cylinders. By means of this construction these two sets of pistons are made to alternate with each other in their movements.

Upon the top of the cylinder is placed a steam chest containing a valve adapted to admit steam to and exhaust it from the space at the intersection of the cylinders, and the speed is regulated by a governor of ordinary construction.

It will thus be seen that when steam is admitted at one end of the cylinder, it presses upon four pistons, which move outward simultaneously, thus utilizing the steam pressure upon all sides of the point of admission. The detail view clearly shows this construction. In this view the pistons of one set have reached the end of their outward stroke, while the other set are at the inner limit of their stroke and are about to take steam.



ROBEY'S STEAM ENGINE.

This improved engine has been patented by Mr. James G. Robey, of Greenville, Texas.

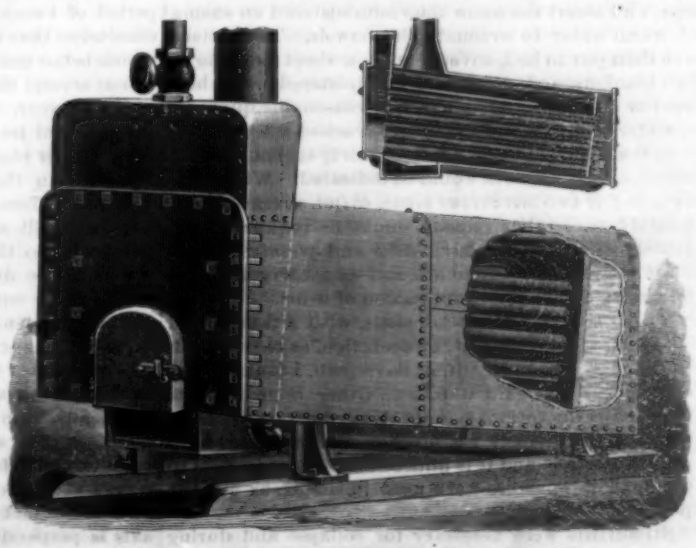
KNIGHT'S IMPROVED HALTER.

AN IMPROVEMENT IN HALTERS.

A simple and effective device for controlling and leading unruly horses without danger of doing them any injury is illustrated by the annexed engraving. It is a halter formed of adjustable head straps, a nose strap containing a flat spring for holding it normally in loose contact with the animal's nose, and a device for contracting the nose strap with more or less force when the halter is unduly pulled upon.

The nose strap is made of two thicknesses of leather, between which is placed a flat spring, bent into such form as will permit of its being worn by the horse without discomfort when he pulls lightly on the leading strap. The ends of the nose strap are provided with yokes, in which are journaled friction rollers. A strap passes through these yokes and partly around the rollers. To the center of the strap is fastened a guide yoke, furnished at its rear end with two friction rollers, between which project the ends of the strap referred to. These ends receive between them a ring, and are fastened together by stitching or otherwise. The snap hook of the usual leading strap is received in the ring. Whenever the horse pulls unduly on the leading strap, the ends of the strap which pass outwardly between the rollers are drawn outward, thus causing the contraction of the nose strap with a force proportioned to the pull of the animal. The pressure of the strap upon the nose is sufficient to secure the desired result. As soon as the horse stops pulling, the elasticity of the spring returns the parts to their normal position.

The halter is made so that it may be adapted to the



TOOLE'S IMPROVED STEAM BOILER.—(See page 68.)

head of any horse. This useful invention has been patented by Mr. Joseph Knight, of Livermore Falls, Maine.

A NEW STEAM BOILER.

We give an engraving of a steam boiler which was recently patented by Mr. Charles O. Toole, of Dubuque, Iowa, containing novel features for which superiority is claimed. It is of the water tube type, the connection between the tubes being secured by water heads at opposite ends of the boiler. The tubes are inclined to secure a good circulation and to facilitate the escape of steam to the front water head when it is delivered to the steam dome above. The tubes are arranged to form a fire chamber in the front of the boiler.

A baffle plate resting upon or supported above the upper row of tubes causes the flame and products of combustion to pass rearwardly before reaching the smoke pipe.

Stay bolts are introduced wherever necessary, and a series of rods passing through the tubes connect the front and rear heads of the boiler.

To insure a complete circulation of the water, the front and rear water heads are connected by a pipe which is entirely outside of the heating compartment.

The front water head is provided with an arched opening for the fire door.

When it is desired to clean the tubes, the front plates of the water heads are removed, thus giving access to the tubes through the water heads. By means of this improvement every part of the surface of the tubes is submitted to strong heat.

The boiler when filled or empty is lighter than cylinder boilers of the same capacity, and the tubular construction permits of carrying a high pressure with safety.

A Homeopath on Yellow Fever.

Dr. Henry R. Stout gives, in the *N. A. Journal of Homeopathy*, an interesting account of his experiences at Jacksonville, during the yellow fever epidemic in that city in 1889. He says as many as possible of the unacclimated nurses were sent to the Sand Hills Hospital. This hospital was situated in the pine woods, three miles from the city. The non-contagious character of yellow fever was well illustrated at this hospital. With between two and three hundred patients during the epidemic, not one of the nurses or attendants had the disease. The pure air of the pine woods did not become infected.

Another illustration was given by the immunity enjoyed by those families who lived at Pablo Beach, 16 miles from the city, on the seashore. Gentlemen from here, as well as from other points, would come to the city each day at 9 o'clock and return at 4 o'clock, and in some cases visited their friends who were six, but not one had the disease, nor were the germs carried to any of these points.

Yellow fever is pre-eminently a disease of the night. I doubt if it is ever contracted during sunlight. The attack was not generally preceded by any prominent symptoms, and the person might be seized suddenly with a chill, soon followed by fever, aching of the bones, etc. In some the attack was ushered in with great nervousness and a feeling of alarm. I had cases of men who could not control their emotions, but would weep when first attacked. This feeling was probably due to the depression felt by every one, whether sick or well. Some cases were very turbulent and restless, and required the most careful attention. Should they uncover themselves and the perspiration thereby be checked, the result was liable to be serious. In our practice we did not induce the excessive sweating that our allopathic brethren did. Their patients would not only saturate the bedding and mattress, but in some cases would wet the floor underneath the bed.

We generally began the treatment of a case with a hot foot bath, which relieved the pains and nervousness, and about the same time administered an enema of warm water to evacuate the bowels. The patient was then put to bed, covered with a sheet and one or two blankets, and *aconite* 3x administered every half hour or hour. He was allowed a reasonable quantity of water to drink, and sometimes cracked ice.

In the course of twenty-four or thirty-six hours either *belladonna* or *bryonia* would be indicated. Within the next day or two *mercurius vivus*, *china*, *arsenicum*, or possibly some other remedy would be required. *Argentum nitricum*, *sulphuric acid* and *arsenicum* were sheet anchors in black vomit, and *cantharis* and *apis* for scanty or complete suppression of urine.

A decoction of *watermelon seeds*, with a teaspoonful of *gin* to a small glass of the decoction, as recommended to me by Dr. Falligant, of Savannah, I found to act exceedingly well as a diuretic. Other remedies were required in the various complications, but our works on practice, particularly "Kippax on Fevers," treat fully on these points, and it is unnecessary for me to refer to them. The remedies were used in the 3x, 6x and 30x potency.

Stimulants were necessary for collapse and during convalescence, and of these brandy and champagne were the best. The latter particularly is exceedingly beneficial.

The diet must be managed with the greatest care. A return too soon to a substantial diet is almost certain to be followed by disastrous results. During the course of the fever gruel should be the only food allowed, followed on the third or fourth day by chicken broth, milk, or milk with lime water. The bowels should be moved by enemas of warm water.

Our allopathic brethren, with nothing to guide them in the selection of remedies, floundered about in their usual aimless manner. The germicidal treatment with *bichloride of mercury* was very popular with the doctors. They were determined to exterminate the germs which infested particularly the intestines, but appeared to lose sight of the fact that the microbes could withstand more *mercury* than the unfortunate patient, and the result was generally disastrous to the patient.

The very best and most rational allopathic treatment can show no such results in yellow fever as homeopathy has shown in many epidemics. Under this treatment the disease is no more to be feared than an ordinary remittent fever. That such is the case is capable of demonstration from the books of the Board of Health. There were reported 4,696 cases, with 430 deaths, a mortality of 9 2-10 per cent. Of this total number of cases 2,173 were white, with 331 deaths, a mortality of 15 2-10 per cent. The mortality among the negroes was 4 per cent. At the Sand Hills Hospital 216 cases were treated, with 34 deaths, a mortality of 15 7-10 per cent.

There were treated homeopathically by Dr. P. E. Johnson, Dr. C. W. Johnson, and myself, 501 cases, with 13 deaths, a mortality of 2 6-10 per cent. This death rate can, I think, be properly compared to that of the whites, inasmuch as we had very few colored cases; but even compared to the general mortality rate it is less than one-third.

It was reported in the newspapers that Mr. Thomas A. Edison claimed that an epidemic could be prevented if on the discovery of the first case or cases the ground about the house and streets about the block were saturated with a germicide. To get an authoritative statement I addressed a note to him, asking for further information. He replied that a five per cent solution of *caustic soda* would destroy every living thing, both animal and vegetable; that it would remain where it was put for weeks, notwithstanding rain; and that germs passing along the ground would be killed by it. If the theory of the propagation of yellow fever along the surface of the earth be correct, and there is every reason to believe it is, the plan of Mr. Edison is well worthy of trial.

Venus.

Signor Schiaparelli, the Italian astronomer who has made more wonderful discoveries among the planets than all the other astronomers of our day put together, has just furnished a new surprise, greater even than his recent discovery that Mercury performs only one rotation in the course of a revolution around the sun. He now asserts that Venus, the brightest of all the planets that we see, the twin sister of the earth, which is at present glowing with nightly increasing splendor in the west after sundown, also turns but once on its axis in the course of a revolution around the sun. In other words, there is no alternation of day and night on Venus, as on the earth. The planet enjoys perpetual day on one side of its globe, while the other side is plunged in unending night.

Astronomers have heretofore believed that the time of Venus' axial rotation corresponded almost exactly with that of the earth's, namely, twenty-four hours. This was supposed to have been established by noting the return of spots visible on Venus to a similar position night after night, but Schiaparelli shows that some of these observations have probably been misinterpreted, and that instead of indicating a rotation period of twenty-four hours, they rather confirm his conclusion that the rotation is performed in 224·7 days, which is the time the planet takes to complete a revolution around the sun, or, in other words, is the length of Venus' year. Venus is about 67,000,000 miles from the sun, and its orbit is more nearly a circle than that of any other planet. It follows that there is very little variation in the amount of solar heat falling upon Venus at different periods of its year.

Schiaparelli says the axis of rotation is nearly perpendicular to the plane of the orbit. If that is so, Venus has no diversity of seasons such as the earth enjoys. Its equator forever burns with the ardent heat of an unending summer, and its polar regions undergo no change of temperature. Inasmuch as Venus receives almost twice as much light and heat from the sun, in consequence of its greater proximity, as the earth gets, it must be pretty hot in the equatorial regions, on that side of the planet which perpetually faces the solar furnace. If what the great Italian observer says about Venus' rotation is true, then the additional fact announced by him that the planet's axis is perpendicular to the plane of its orbit seems almost a providential provision of nature, for in that way it is rendered possible for the polar regions to enjoy a comparatively mild climate, although the equator and the spaces corresponding to our tropical and temperate zones may blaze with unendurable heat.

If the axis of Venus were inclined like that of the earth, the consequent variation of seasons would plunge the poles alternately into a day of fierce sunshine enduring for seventeen weeks and a frosty night of equal duration. The result would be that life under such forms as it assumes upon our globe would probably be impossible anywhere on the surface of Venus, for the sunward side of the planet would be scorched while the night side was frozen. But if, as Schiaparelli's observations indicate, the poles of Venus are not tipped now one and now the other toward the sun, but remain upright at right angles to the direction of the sun, then in their neighborhood the heat may be tempered just as it is at the poles of the earth, in accordance with the law of incidence of the solar rays. Of course the cold, being unbroken, may be very intense just around the poles themselves, and in fact within a few years past white spots have been discerned on Venus, about where the poles would be situated according to Schiaparelli's idea, and these spots may be caused by accumulations of snow and ice there. But in somewhat lower latitudes an agreeable mean might be found between the consuming heat of the equator and the glacial chill of the poles.

The imagination may not go far astray in picturing these intermediate zones, on the sunward side of the planet, as the scene of activities corresponding to those that mark the human occupation of the inhabitable parts of the earth. To be sure, the inhabitants of even these favored regions on Venus could not enjoy the agreeable interchange of day and night, but would be perpetually shone upon by the sun, but even here there are indications that nature may have provided at least a partial compensation. All telescopic observations of Venus testify to the blinding brilliancy of its surface, and the most reasonable hypothesis yet put forth to account for this phenomenon is the existence of an extraordinary amount of cloud in its atmosphere.

Anybody who has watched a sun-illumined cloud knows how splendidly it reflects the light, and, of course, in looking at the clouds of another planet we can practically see only their sunny side. If, then, as appearances indicate, Venus' atmosphere is largely filled with clouds, the effect would be to screen off the superabundant sunshine, and perhaps render even perpetual daylight far less obnoxious than we might, at first sight, be disposed to regard it. There are reasons for thinking that the atmosphere of Venus is most abundant. Its depth has been calculated to exceed that of the earth by about one-third, although Venus is a slightly smaller planet than ours. The existence of watery vapor in this atmosphere has been clearly established by spectroscopic examinations. Of the extent or even the existence of oceans on Venus we know nothing by direct observation, but since the planet possesses an atmosphere and clouds, it is not unreasonable to conclude that it must have oceans capable of supplying the needed vapor.—*New York Sun.*

Delayed Telegram.

The Western Union Telegraph Company was sued for $35,000 in the Chicago Federal Court by Mrs. Hannah Joseph. The plaintiff is the wife of a traveling salesman who, while at Paxton, Ill., one Saturday evening, telegraphed his wife that he would be home the following day. He did not come, and Mrs. Joseph was seized with hysterics, which a physician said were the commencement of a more serious disorder. Mrs. Joseph sent a message to her husband asking him why he did not come, but did not receive a reply until the following day. During all that time she suffered great agony. Judge Gresham heard the evidence and instructed the jury that, while the company was liable for the delay in delivering the telegrams, Mrs. Joseph's sufferings commenced before she sent the message, and she could only recover the price paid for tolls. A verdict for 25 cents was returned.

He Will Succeed.

A young man going through a course of electrical engineering at the Thomson-Houston works, in Lynn, Mass., writes to his friends in Osceola, Fla., as follows: "Here I am at last. I started at work in the Thomson-Houston electric factory last Monday. To say I am surprised is putting it mildly. There are over 4,000 men employed in this factory. It is a good sized town in itself. My first position is in the expert department adjusting and testing arc lamps. I am to go through a very thorough course, and be turned out a full-fledged electrician, but it comes very severe upon a lazy devil like me to go to work at 6:30 A. M., and continue until 6 P. M. But if others can stand it, I can."

"THE widest plank on earth" is on exhibition at the railroad depot in this city. It was cut at the Elk River mill, and is sixteen feet in width. It will be among the Humboldt exhibits at the World's fair in Chicago.—*Humboldt Standard.*

IMPROVED MOVABLE DOCK CRANE.

Our illustration shows one of two coaling cranes erected at the General Terminus Quay, Glasgow, for the Caledonian Railway Company, by Messrs. George Russell & Co., engineers, Motherwell, near Glasgow. These cranes, says the *Engineer*, are constantly at work, loading coals into vessels, by lifting the railway wagons in a cradle, and occasionally loading and discharging boilers and other heavy pieces as required. The special feature is that these cranes are semi-portable and self-contained, including their foundation seat, and could at little expense be removed to another site.

The seat of the carriage is constructed according to Mr. Russell's patent. It is 4 feet deep, of plates 1⅛ inches thick, and angles of steel riveted together. One side rests on, but is not fixed to, the quay wall. The other side rests on a concrete block, to prevent sinking into the ground. The bearing on the quay wall is 17 feet long and 12 feet broad, measured at right angles to the edge of the quay. The seat carries a forged wrought iron post, with Russell's patent bearing and inclosing jacket. The advantage of this arrangement is that the surfaces on which the crane revolves are protected from dust, while the bearing surfaces are adjustable and removable without disturbing any other parts. The jib is 47 feet long, with a radius of 27 feet, and is fitted with a pair of rails inside, on which a weight travels on four flanged wheels. This weight is attached to the end of a cradle by a chain which passes over a pulley near the top of the jib, so that while the cradle is being raised the weight travels down the jib, and *vice versa*.

The tipping of the cradle is controlled by the driver of the crane by a catch worked from the platform, which fixes the tipping chain from lowering, while the main chains are lowered out sufficiently to allow the coals to slide out of the wagon. This arrangement dispenses with the man usually employed to wind up the tipping chain. There are two pairs of engines—those for hoisting having 9 inch cylinders, while the turning engines have 6 inch cylinders, all fitted with link reversing motion. The driver's platform and coal space are covered by a neat wrought iron house, with lock-up door, and the handles are all arranged near a window in front, from which the driver has a full view of the load. All the parts have a very abundant margin of strength. The toothed gearing is of cast steel, and altogether these cranes are specially well adapted for continuous heavy work, with a minimum expense of tear and wear. The weight of each is 93 tons.

Processes for Preserving Iron from Rust.

Besides the Bower-Barff furnace process for protecting iron by covering it with a deposit of the black or magnetic oxide, which is not liable to corrode, and the numerous copies of this method which have come before the public, the same object is alleged to be attained by the De Meritens electrolytic process. In this method the object is immersed near the anode in a bath of distilled water heated to 80° C.; a plate of copper being the anode. The action that goes on results in the formation on the iron of a layer of magnetic oxide, which is treated afterward in the ordinary way by oiling, etc., according to the style of surface required. Peroxide of lead can also be used for the same purpose; it gives a black, very adhesive deposit by the electrolysis of an alkaline solution of litharge. According to *La Lumiere Electrique*, an analogous process, the invention of a Mr. Haswell, has recently been experimented with in Vienna. In this process iron or steel is plunged as an anode in a bath containing from 0·5 to 5 per cent of chloride or sulphate of manganese, with from 5 to 20 per cent of nitrate of ammonia. The electrolysis is effected in the cold bath, with carbon cathodes. Feeble currents of from 0·1 to 0·2 of an ampere cover the iron with a deposit of peroxide of manganese, which adheres well and is not subject to further oxidation. In view of modern revival of artistic blacksmiths' work, there is likely to be a brisk demand for these preservative processes, which, while they do not hide the hammer work like paints, shall be even more effectual in preventing rust.

The Birch.

London Garden speaks as follows regarding a valuable hard wood: "The birch is capable of supporting a much greater degree of cold than any other tree. In the old world its northern limit is 71 degrees upon the west and 63 degrees upon the east coast; in America its northern limit is 64 degrees upon the west and 58 degrees upon the east. In Germany the highest elevation at which it is found is 5,200 feet above the level of the sea; in Sweden at 3,900 feet, and in Lapland at 1,722 feet. It is worthy of remark that this tree decreases in size not only as it advances toward the north, but also as it proceeds southward beyond the limits of its native region. It attains its highest perfection and greatest height in Germany and southern Sweden. The birch is not particular in its choice of soil or situation, and will grow almost equally well in sandy, rocky, dry, or damp soil."

Correspondence.

The Hydraulic Ram.

To the Editor of the Scientific American:

In your notice of Ribes hydraulic ram in your issue of July 5, you state that in the "old style of ram it is necessary to take off the air chamber at least once a month to exhaust the air." You should have said "in order to replenish the air," which will become exhausted in less time than that, unless some provision is made to keep up the supply, and this can easily be done by drilling a very small hole (about the size of a horse hair is right) through the brass flange ring by which the drive pipe is attached to the ram. Have this hole in top when the pipe is connected, and it will furnish a constant supply of air to the ram, and do away with the necessity of taking off the air chamber, or pulling out plugs and getting wet, with the thermometer at zero. The manufacturers of rams are probably ignorant of the fact that their rams will not work without air, or they would put something in them to furnish it.

GEORGE Q. PEYTON.

Rapidan, Va.

COMET BROOKS 1 OF 1890.

To the Editor of the Scientific American:

The comet discovered by me on March 19, in the eastern morning sky, is now in a very favorable position for observation in the evening. Although it is becoming fainter, it is still nearly three times brighter than at discovery, and can be readily picked up with telescopes of moderate aperture.

I give herewith its telescopic appearance on June 15,

COMET BROOKS 1 OF 1890—TELESCOPIC VIEW.

which was about two weeks after its perihelion passage. The head of the comet was surrounded by a beautiful semicircle of telescopic stars, as shown, presenting a fine field indeed.

The comet is situated well up in the northwestern heavens. It has recently passed between the last two stars in the handle of the "Big Dipper," and is moving in a southerly course through Canes Venatici. Its present direction of motion is very nearly on a line drawn south from the star Mizar—the middle star in the handle of the Dipper—to a point two and one-half degrees above the star Alpha Canum Venaticorum.

To enable any one to easily locate the comet, I will say that on August 1 it will be about eleven degrees south of Mizar, and on August 10 the comet will be about three degrees south of its place on August 1. On August 20 it will be about two and one-half degrees above the star Alpha Canum Venaticorum, and on the last of August, four degrees south of its last mentioned position. These positions will indicate its course, so that the comet may be found on any intermediate date, or traced still further in its celestial journey.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., July 23, 1890.

The Kerosene Lamp and its Defects—A New Invention Greatly Needed.

To the Editor of the Scientific American:

Another of those frequent kerosene oil tragedies has just occurred in West Ringe, N. H., where a woman and child have been burned to death.

Being in the lamp and oil stove business, I think it advisable to furnish a few hints in connection with the immediate cause of such disasters. Before proceeding further, I must remark that the present system of burning oil, both in lamps and oil stoves, seems like a satire upon this progressive age.

A flame oxygenated by air currents to the fiercest heat is placed directly in contact with a brass tube through which all the oil consumed has to pass. Of course this tube, being always made of brass, is one of the most rapid conductors of heat, and soon becomes excessively hot. A better device for generating explosive gas could hardly be conceived.

The worst of it is that the gas thus rapidly generated falls into the oil font and is all ready for an explosion the moment that the smallest part of it comes in contact with fire. A slight current of air will often convey some of this gas to the flame, when the conflagration or explosion is almost sure to follow.

If the numerous inventors who read your instructive journal could substitute some device for the present mechanical and scientific outrage, something not too complicated and expensive, I risk nothing in asserting that such a device, if brought before the public in a business way, would become universal.

The horrors just referred to have now become so frequent that they receive only a brief and passing notice in the daily papers.

KEROSENE.

Charlestown, Mass.

How a Snake Climbs a Tree.

To the Editor of the Scientific American:

As a reader of the SCIENTIFIC AMERICAN for the last twenty years, I have often read very interesting articles on the above subject, but have found little real information as to how the feat is actually performed; that is, in regard to the climbing of large trees without limbs, and trees with smooth bark. Many writers have described snakes found in situations indicating that they must have climbed so and so, to reach such and such positions, but on the 7th day of this month I was treated to the actual observation, with my own eyes, of not only the climbing, but the descent, which I will try to describe as near accurately as it is possible for a man to tell a snake story.

While exploring in search of ferns a very deep and thickly wooded ravine with tall trees above on either side and underbrush almost entirely shutting out the light of the sun, and rendering the place cold and damp, yet almost stifling for want of a circulation of air, I suddenly came upon a common black snake about four feet in length sticking fast to the side of a tree. My first impulse was to stop short and see all I could before he should take fright and drop, but after watching him until tired, I began to try to disturb him, thinking he would let go the tree and drop to the ground, as his head was but about six feet above the ground. This he did not intend to do; it was not his style of doing business, as I afterward became convinced. Nor would he move until all the sticks and stones at hand had been thrown at him, but one, however, having touched him about the middle of the body, causing him to loosen from the tree about one foot of his body, which he carefully replaced. The tree, I should state, was a cottonwood about 15 inches in diameter, with the ordinary rough bark common to this tree when of this size, very perpendicular and straight, and with a distance of about 35 feet to the first limb.

Failing to hit him further, I next cut the longest stick near me (about 10 feet) and getting a little closer by climbing upon a fallen tree top, I tried to touch him, but the limbs settling down with my weight, put me again out of reach. I climbed the steep hillside and came down directly in front and within six feet of him, where I stood for some time taking a more accurate survey. I found him in almost a perpendicular position, but with very short and abrupt curves in a number of places in his body. The straight places in his body were fitting very closely in the conjugations in the bark for six or eight inches at a stretch, and taking advantage of every offset in these conjugations, both to the right and left, yet with no intention whatever to encircle the tree, which could have been easily done by a snake of his size.

After a long examination and study of these traits, I at last resolved to make him do something, so I touched him gently with my stick, when he began moving his entire length, first turning his head downward. He carried his head and some three or four inches of his neck erect, the same as if crawling on the ground, and picked out a route down to the ground, not more than six inches from where the rest of his body was going up. He lost no advantage he had already possession of, and taking things very deliberately he thus gained the ground, not moving the length of himself in less than one minute. I thus had before me the very rare spectacle of a snake climbing both up and down a tree at the same time. I have no doubt but that he could have gone to the very top of the tree just as well as six feet, and have come down as well, had he so desired. I do not think his object was to sun himself nor to catch birds, as the dead tree top close by offered a better position for either, but to get in a position to catch flies, in which the place abounded, probably attracted by the coolness of the glen on a very hot July day.

JOHN E. GARSIDE.

Peoria, Ill., July, 1890.

To kill blue grass growing between bricks around the lawn, wash the bricks with salt water or strong solution of soda.

THE CHICAGO WORLD'S FAIR.

The City Council of Chicago has passed an ordinance granting the use of the lake front as part of the site for the World's Fair. This is an admirable location, and will greatly add to the interest and success of the noble enterprise.

The ordinance pledges the city of Chicago to pay for any piling or filling in of the lake that may be required to the extent of $3,000,000, and after the fair is ended returns the made ground to the city, to be used forever as a public park. Not less than one hundred and fifty acres of the lake front are to be utilized for World's Fair purposes. It is stipulated that no bargain of any sort is to be entered into between the Fair Directors and the Illinois Central Railroad for the control of that portion of the lake front occupied by the Illinois Central tracks, unless such bargain shall be first approved by the City Council. In case the city of Chicago loans or subscribes $5,000,000 to the stock of the exposition, the directors guarantee that the amount of money returned to the city shall not be less than the cost of whatever piling or filling in of the lake may be done. The ordinance does not fix any maximum number of acres to be utilized of the lake front, but the greatest amount obtainable by any of the plans thus far informally outlined is 250 to 300 acres.

DESIGN FOR COLUMBIAN EXPOSITION ON THE LAKE FRONT, CHICAGO.—[*From The Graphic.*]

Length of extended Lake Front Park to Park Row, 1¾ miles; area, 375 acres. Length of Park from Sixteenth Street to Twenty-second Street (not shown in illustration), over one-half mile; total area, 450 acres.

A recent number of the *Graphic*, of Chicago, contains a spirited sketch of the great fair as it will or ought to look when in full operation. We give a reduced copy of the picture, and also the following observations from our enterprising contemporary:

"From its very inception, the Lake Front appears to have been the predestined site of the great Columbian fair. From its original presentation months ago, upon the plans submitted by Messrs. Telford Burnham and James F. Gookins, it has irresistibly grown in public favor. The first report of the Committee on Buildings and Grounds of the directors of the Columbian exposition was practically unanimous in its choice. The partisans of other sites have steadily fought its acceptance, and though a concerted and organized attack succeeded in creating a transient gust of sentiment in favor of Jackson Park, the public feeling soon veered round again to the ideal and inevitable site.

"The structural features of the fair will be the next most important consideration, and some of the more prominent and costly of these have already received the most painstaking and critical investigation. It is needless to say there is no lack of plans and suggestions in the hands of the directors, including designs for monuments, towers, arches, gates, and palatial structures, and many of them are of a highly creditable character.

"The *Graphic* artist has been permitted to inspect the plans and drawings of some of these proposed structures, and to acquaint the public with their general character has grouped within the area of the exposition site, as contemplated, some of the more important commemorative features.

"The most conspicuous object in the foreground from the southern view will be the water tower. This will be an indispensable adjunct to the new south side water works, furnishing water for the exposition. The exposition may require more water daily than a city of five hundred thousand people, and the new works will furnish, through the new tunnel, the purest and coolest water from the depths of Lake Michigan, six miles out.

"The second imposing structure is suggestive of the Art building, intended as one of the permanent and most attractive features of the exposition. It will be of classic design, as the drawing indicates, and of a capacity for affording the most advantageous display of the most magnificent, rare, and costly productions of all nations contributing to the exhibit.

"North of this, connected by an annex, appears the National Museum, arranged upon the plan of the South Kensington and British Museums combined. It is expected that the Crerar Library will find a permanent home within the walls of this grand museum. Another specialty of this department will be the Ethnology of North and South America, a unique collection, which will prove a great attraction to the savants of the old world.

"The next special features of the fair, and permanent ornaments of Chicago, will be the two grand pavilions, one to be known as the Columbian Pavilion, constituting the great Memorial Hall, and the other to be called the Woman's Pavilion, containing the Hall of Isabella, and a majestic statue of the Spanish queen. West of these two pavilions grand colonnades will describe the arc of a circle, the form of the buildings being specially adapted for the exhibition of sculpture.

"Connecting on the north and south with the colonnades will appear the grand Triune Arch of America, constructed of bronze and marble. The central span of the arch will be one hundred feet. It will face the Congress Street entrance. Eastward of the arch there will probably be an unobstructed opening to the border of the lake, the entire space forming a pathway of flowers.

"North of the colonnade, connected by annexes, will be erected the permanent exposition building, the plan of which has been described in a former number of the *Graphic*.

"It is expected that the projected government building will be placed next north of the permanent exposition, and that the appropriation therefor, already made, together with that now contemplated by Congress for a new federal building in Chicago, may be applied to this purpose. Such an act would be a splendid stroke of economy for the government, as enabling it to secure a valuable site for a permanent building without cost, and at the same time furnish a valuable contribution in aid of the exposition. No better site could be desired for the federal offices than in the vicinity of the docks and railroads converging at the lake front.

THE ESPLANADE.

"East of this line of noble structures will be found the grand plaisance or esplanade, a mile long and five hundred and fifty feet wide, ornamented with statues, cascades, fountains and picturesque architecture, and presenting from either north or south a scene of unequaled beauty. The plaisance, 150 feet wide, rises gently to the promenade, decking the railway right of way. Between the plaisance and the subway passes the splendid roadway extending from Michigan Avenue to the north lake shore drive. The facades of the stupendous structures as seen from Michigan Avenue will present probably as sublime and beautiful an effect and architectural display as may be found anywhere in the world.

"The covered way is for the passage of the Illinois Central Railway. It will comprise a mammoth depot three hundred feet wide and over one mile long, provided with ample offices, toilet and waiting rooms, staircases, gates, etc. The only openings upon the roof or promenade are for light and ventilation.

"Eastward of the promenade and driveway come the foreign buildings and pavilions of the different States, extending one and one-fourth of a mile lengthwise and covering a space of about six hundred feet in width.

"Still further east appears the Grand Spa, sloping gently to the water's edge, and the landings of excursion steamers, amid a wilderness of natural and artificial adornments in the shape of open air theaters, curiosity shops, surrounded by fountains, flowers and lawns.

"It will be seen that ample provision is made for en-

trances and exits from every quarter of the grounds, but excursionists may be landed within the grounds. It will not even be necessary for visitors south of Twelfth street or west of the river to come east of the river, or for residents of the North side to come south of the river, by the usual routes, in order to visit the exposition. The existing railroad circuit will run trains every minute, from every division of the city, landing passengers for five cents at the center of the fair; and passenger boats from every landing on river or lake shore can reach the exposition water front in all weathers.

"It only remains to notice in this connection the really noblest feature associated with the fair, the magnificent bridge which is to span the Chicago river at an elevation of one hundred and thirty feet, joining the termini of the Lake Shore driveway and Michigan avenue. The bridge will begin at Michigan avenue, extending one thousand feet east on Monroe street, thence north, reaching the summit by a rise of one foot in sixteen. The bridge will consist of three arches, the central span being fifteen hundred feet. The main arch will spring from Lake to Ohio street. Curves are the most striking forms of structural beauty, and it is thought that this colossal bridge, representing the gateway of the imperial city, and surmounted by symbolical works of art, is one of the noblest conceptions of the many that have been suggested. The estimated cost of the structure is $3,000,000.

"The objection so frequently raised that there is insufficient time for the stupendous work of extending and filling in the lake front is negatived in the most direct and emphatic manner by the best engineering experts. President Ellsworth, of the South Park Board of Commissioners, unhesitatingly declares that the work can be accomplished in a satisfactory manner without retarding the fair. Indeed, investigation has demonstrated that the preparation of the Lake Front as proposed would be more economical and expeditious than any other site that has been urged upon the directors.

"One of the most important considerations in influencing the Lake Front selection is that the Illinois Central company surrender all riparian claims and right of way between Monroe Street and Park Row, and all right of way between Sixteenth and Twenty-second Streets. Then the Lake Front will be practically wedded to Jackson Park, completing Chicago's magnificent and unparalleled park system. The exposition overflow from the Lake Front will find all essential accommodation southward. The proposition to connect Jackson Park, and perhaps Garfield Park, and the Lake Front by a railroad operated by the fair association obviates every objection to the division of exhibits. This would afford ready and free transportation to all visitors and would largely enhance the fair receipts.

"The financial problem of the fair has been effectually solved by the selection of the Lake Front. It is a site which practically furnishes $25,000,000 for fair purposes. Any other selection would have left the directors to depend upon the meager subscription fund of $5,000,000 and such additional appropriation as might accrue from legislative authority."

A Boiling Lake in Nevada.

Recently an item has been going the rounds in regard to a boiling lake near Lassen's Peak, California. It is not generally known, but we have in Nevada a similar boiling lake. It is situated at the eastern base of the first large mountain range east of the Sink of the Carson. It lies on the edge of an immense desert—a desert so large and scorching that in summer the Indians never attempt to cross it except at night, and even then they always go provided with a large supply of water. On three sides of the lake are rocks two or three hundred feet high, which are perfectly bare and are burned to a deep brick red. The area of the lake is about two acres. Though steam is constantly rising from the water, the whole surface of the lake does not boil. The agitation—boiling—is confined to the great springs which burst up at several points. These springs force columns of water from a foot to two or three feet in diameter to a height of over twenty inches above the general surface of the lake, causing a loud rippling sound and considerable local commotion. The water of the whole lake is doubtless boiling hot, though not seen to boil, for a brook flowing from it down into the sands of the desert sends up a cloud of steam for a distance of several hundred yards. About a mile from the lake is a great deposit of sulphur, running through which are streaks of pure alum, from two to six inches wide.—*Virginia (Nev.) Enterprise.*

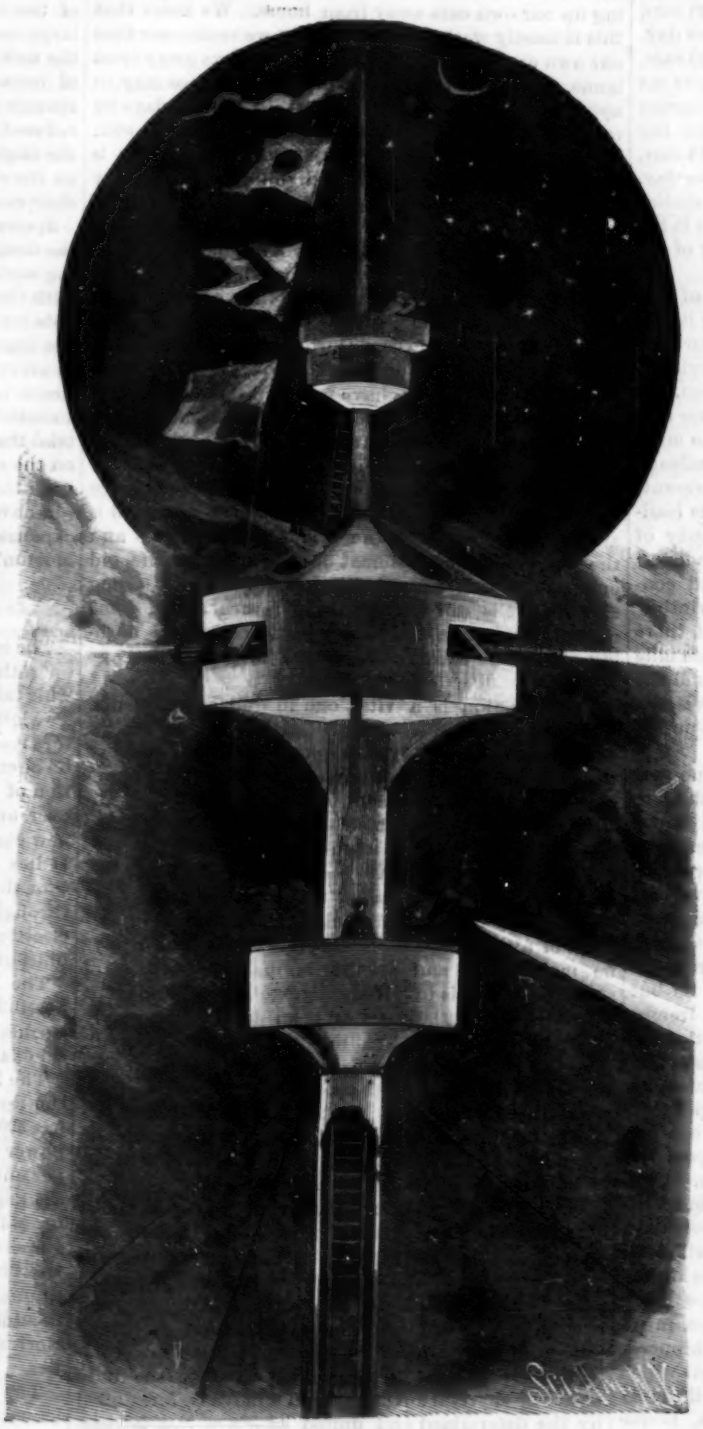
MAST OF A MODERN WAR VESSEL.

Although modern warfare is as different from that of the days of Greek fire, the catapult and the cross bow as is our mode of living from that of the ancients, still in some of our modern appliances there is a remarkable resemblance to some of the very ancient enginery. In early naval warfare the mast of a vessel was an important aggressive point, and from the mast head were thrown javelins, arrows, hot shot, Greek fire and other destructive missiles. The masthead was then, as now, the chief lookout, and as all naval battles were at short range, equivalent almost to actual contact of the vessels, the mast was perhaps even more important than the main armament of the vessel.

Among the vessels which Charles I. added to the English navy was one built by Pett, named The Sovereign of the Seas, launched at Woolwich in 1637. The length of her keel was 128 feet, the main breadth 48 feet, and the length from stem to stern 232 feet. The description of this vessel by Thomas Heywood, states that "she bore five lanthorns, the biggest of which would hold ten persons upright, had three flush decks, a forecastle, half deck, quarter deck, and round house. Her lower tier had thirty ports for cannon and demi-cannon; middle tier, thirty for culverins and demi-culverins; third tier, twenty-six for other ordnance; forecastle, twelve, and two half decks, thirteen or fourteen ports more within board, for murthering pieces, besides ten pieces of chace ordnance forward, and ten right aft, and many loopholes in the cabins for musquet shot. She had eleven anchors, one of 4,400 pounds weight. She was of the burden of 1,637 tons." On trial, this vessel was found to be too high for good service. She was therefore cut down to a deck less, and became an excellent ship.

Gunpowder was used as long ago as 1338, and it seems strange to read that at this early period of 1338 iron cannon having several chambers were used. In these early days, arms and ordnance bore such names as these: cannon, demi-cannon, culverins, demi-culverins, sakers, mynions, falcons, falconets, etc.; now we have rifles and howitzers, Gatling and Hotchkiss guns, the mitrailleuse, etc.

Our engraving represents the mast of a modern war ship, with its lookout and its turret. The mast is made hollow, and of sufficient diameter to allow the men to ascend. The lower tower is provided with a search light, which receives its current through wires extending up the hollow mast. The turret is armed upon one side with a single piece of ordnance, and upon the other with a Gatling gun. Above all is located the lookout or watch tower. With such an auxiliary as this, a war ship can seriously harass the enemy, besides doing a great deal of actual damage. By the aid of a strong electric light, aggressive movements may be carried on at night. Not only can these aggressive movements be carried forward, but by means of the light the entire vicinity of the vessel may be searched for torpedoes and torpedo boats, thus rendering practical at night the means of defense against the attacks of these wary enemies.



MAST OF A MODERN WAR VESSEL.

The Art of Living to a Great Age.

The enchanters of China promised the emperors of that country to find an elixir of long life that should efface the irreparable inroad of years. The astrologers and necromancers of the middle ages flattered themselves to have discovered the fountain of youth, in which a person had merely to bathe in order to recover his youth. All such dreams were long ago dispelled by the progress of science. Yet, in the heart of most men there is such a desire to prolong their stay upon the earth that the art of living for a long time has not ceased to impassion a large number of persons who would be willing to endure all the evils of an indefinitely prolonged old age.

One of the perpetual secretaries of the Paris Academy of Sciences has written a volume to prove that man should consider himself young up to eighty years of age. A noble Venetian named Cornaro spent twenty years in a scale pan in order to ascertain what alimentary regimen was best adapted to him. We have known old men who, having learned that M. Chevreul had never drank anything but water, took the resolution to abstain wholly from wine, hoping in this way to exceed a hundred years. Fortunately a rag gatherer, who reached the same age as the celebrated academician, spared them this sacrifice by informing his confrere in longevity that he had never drank anything but wine.

The Society of Hygiene, Vienna, has just started an extensive investigation in order to determine what it is necessary to do in order scientifically to prolong life beyond the ordinary limits and to rival the patriarchs of the Scriptures, as compared with whom M. Chevreul himself was but a child. The society has therefore drawn up a circular which it has sent to all the old men of Germany and Austria occupying a certain position in the world, and which contains a multitude of questions about their regimen, their habits, the duration of their intellectual work, the nature of their recreation, their manner of clothing themselves, etc. The good Viennese hope in this way to get up a practical manual designed for those who wish some day to double their formidable cape of eighty years.—*Iron.*

Cement for Iron Railings.

For the cementing of iron railing tops, iron grating to stoves, etc., the following mixture is recommended; in fact, with such effect has it been used as to resist the blows of a sledge hammer. The mixture is composed of equal parts of sulphur and white lead, with about one-sixth proportion of borax, the three being thoroughly incorporated together, so as to form one homogeneous mass. When the application is to be made of this composition it is wet with strong sulphuric acid, and a thin layer of it is placed between two pieces of iron, these being at once pressed together. In five days it will be perfectly dry, all traces of the cement having vanished, and the work having every appearance of welding.

THE manufacture of cotton goods in Ceylon has for the last few years made remarkable progress. The island promises to become as dangerous a rival to India in that industry as in the cultivation of tea.

Cause of the Constantly Decreasing Mileage of Freight Cars on Home Roads.*

BY W. G. WATTSON.

That it is true that the general average performance of freight cars is constantly decreasing there is scarcely any doubt, although there are no available statistics of a general character to prove the conclusion as an established fact. At the same time it is true that on a majority of the railroads the methods of handling cars, distribution, supervision at stations, records, train services, etc., have been greatly improved during the past ten years; but in spite of this fact the general average car performance has decreased. This leads to the apparently paradoxical state of things that upon the whole the efforts of our association to improve the administration of the car service office have been successful, but that the most important results, *i. e.*, increasing car movement, have not been accomplished.

In the year 1878 the White Line comprised 3,520 cars, the performance of which averaged 70 miles per day. In the same year the Union Line comprised 3,828 cars, and the average performance was 78·32 miles per car per day. At the present time the White Line comprises 13,000 cars, and the average mileage is 29·9 miles per car per day. The Union Line now comprises 9,015 cars, and the average mileage is 36 miles per car per day. Other fast freight lines and railroads show similar figures. This condition is not due to any decline in the method of handling cars, so far as the efficiency of the car service office is concerned.

The car service office has not reached a state of perfection, of course, but it is not less efficient than it was ten years ago. There are, however, forces at work influencing the decrease in the service of cars which are not affected by the most thorough office system. If these forces have any effect at all, it is to reduce and not increase the average car performance, as the more thorough and efficient the office work (from a mileage standpoint, which is the controlling factor at present) the less will be the movement of cars empty, the loaded movement being controlled by the quantity of traffic. . . . The trouble is that new cars are being built faster than new tonnage is developed, and consequently a decrease in car movement is inevitable. In the year 1888, according to Poor's Manual, there were 70,433 millions of tons of freight moved one mile by all of the railroads in the United States, and the number of freight cars owned by them was 1,005,116. Estimating 15 tons per car, the tonnage was moved with a car performance of 4,695 million miles. At 20 miles per car per day, 1,005,116 cars would in one year run 7,337½ million miles, which, after moving the tonnage of 1888, left 2,643½ million miles, or about 36 per cent. to spare. Certainly an allowance of 36 per cent. for the empty movement is sufficient. There can, therefore, be no increase in the average car movement so long as the increase of equipment keeps pace with the growth of traffic.

If there are sufficient cars for the legitimate wants of traffic, why are more being built? There can be but one explanation, and that will show that the freight car has become so great a factor in the competition for traffic that the *number* of available cars, instead of their performance, is the desideratum. Railroads have been so multiplied that nearly all traffic is competitive, and while the rate and time in transit are the controlling factors, neither can avail without the support of a full supply *of the most improved kind* of cars. I emphasize the words "of the most improved kind," because the car of 20 tons capacity has not more than forced the 15 ton car from through service, when its owe usefulness is threatened by the appearance of the 25 ton car. Not only this, but special cars are being built for different classes of traffic; for instance, furniture cars (the larger, the more favored by shippers), ostensibly intended especially for furniture, but which are an active factor in the competition for all bulky shipments, of light weight, such as carriages, household goods, hay, baskets, empty crates, etc. Special horse and cattle cars, refrigerator cars and ventilated fruit cars are also playing well their parts as missionary agents for competitive traffic. A new road is open and puts on a line of new cars, built after the most approved patterns, and begins to compete for business, and the older lines must have cars equally good or lose their traffic. When the crops are harvested, an immense quantity of freight is at once offered for shipment, and the road which has the most cars generally secures the most tonnage. The great delay to the foreign car (the car away from home), both under load and empty, breeds a fictitious demand for more cars, and they are built, when the real, practical need is more movement of the cars already built. Under these conditions the equipments of the railroads are rapidly increasing, and the situation is further aggravated by the great influx of cars belonging to private car companies and shippers of special commodities. Many of the former are turned loose to earn what mileage they can, and, being exceptionally good cars, have an advantage over many cars belonging to railroads. Shippers' cars find their way into service by reason of the traffic that they bring to the line hauling them, and it is fast becoming the rule that every shipper of considerable traffic has his own cars. These cars do not increase the aggregate tonnage, but decrease the service of the cars of the railroads. Competitive passenger traffic has already reached a most expensive state—gilt edged service with vestibuled cars or no business—and to the observing mind it must be plain that competition for freight traffic is fast tending in the same extravagant direction, and that feature which incites the overbuilding of freight cars is the principal factor.

There are, however, other minor causes influencing the over-production of freight cars, and consequently the decreased general average performance, which are directly attributable to the car service office. I refer to the general indifference with which foreign cars and the requests of their owners for their return are treated. We devote almost all our entire energy to following up our own cars away from home. We know that this is mostly wasted energy. When we remember that our own car is the foreign car when it gets away from home, the effect of this principle in the service may be appreciated. It is well enough to talk about delays by reason of billing "to order," overcrowded yards, etc., but the principal cause of delay to the foreign car is that car service officers are dividing their energy among all the other railroads of the country, instead of concentrating it for the movement of cars on the home line. My company has now a number of cars on one of the important lines, and they have been there since last February, notwithstanding our repeated efforts to get them home. The cars have been empty for at least two months. During this time we have received quite a number of cars belonging to the road in question, and tracers have followed them thick and fast. It is a great mistake to allow cars to stand around loaded or empty unnecessarily, as the cost of the standing room and the retarding of traffic in transit far transcends the mileage consideration. The mileage system of settlement for service of cars interchanged is also a fruitful cause for the building of new cars and the consequent curtailment of the service of the old ones, as the preference of shippers for the new, strong cars so swells the mileage as to return a handsome rate of interest on the money invested, to say nothing about the earnings from the increased tonnage secured.

This question is a vital one in dollars and cents. Placing the low water mark of acceptable service at 40 miles per car per day, a surplus of 500,000 cars above the requirements of the service is shown. This represents a needless investment of about $250,000,000. Instead of a return upon this enormous investment there is a further outlay for maintenance of $40 per car, amounting to $20,000,000 per annum. The surplus cars must also have standing room, which means 3,310 miles of side tracks, representing an additional investment of about $49,650,000. This side track must always be maintained, and another annual expenditure of about $3,310,000 is involved. Altogether a permanent investment of $299,656,000 and an additional yearly expenditure of about $23,310,000. But this is not all. More locomotives are required and the whole operating service assumes greater proportions than would otherwise be necessary. The question therefore involves the consideration of an interest of vast magnitude, and its solution is to be had only through a complete change of practice in supplying and moving cars.

The improvement of car service is not, in its most important sense, a question of operating details, but one of administrative policy. What, therefore, will be the outcome? The tendency of the time is toward consolidation. Will the car service evil reach such proportions as to render the consolidation of individual equipments under independent co-operative companies for various geographical districts the only means of survival? Or can such a move be forestalled by the determined and united efforts of this association to reduce the detention of the foreign car both under load and empty?

* A paper read before the International Association of Car Accountants, at New York, June 26, 1890, by W. G. Wattson.

Improved Arrangement of Marine Engines.

The steamship City of Vienna, which was built by Messrs. Workman, Clark & Co., Belfast, and engined by Messrs. John & James Thomson, Finnieston Engine Works, Glasgow, to the order of Messrs. George Smith & Sons, Glasgow, went out on her official trial on the Firth of Clyde recently. The City of Vienna is a vessel of 5,000 tons register, 412 ft. long, 46 ft. 4 in. beam, by 29 ft. 3 in. depth of hold, and is a splendid addition to the fine fleet of City Line steamers trading between the Clyde and India. She has three decks, the upper and main being steel, covered with teak. She is fitted throughout with all the latest improvements, and is of the highest class, every modern requisite for the comfort of passengers and the expeditious handling of the cargo having been adopted. The propelling machinery of the City of Vienna is of special interest, and particularly the main engines, which are a complete departure from the previous arrangements of marine engines of high power.

Howden's system of forced draught, of which the owners had previously acquired a very satisfactory experience, has been adopted, also Weir's patent feed pumps and evaporating apparatus; and to the engines has been fitted Morton's patent valve gear, Toms' patent slide valve being fitted to the low pressure cylinder. The engines of the City of Vienna are the largest to which this system of valve gear has been hitherto applied. They are of the triple expansion type, on three cranks, having cylinders 33 in., 53 in. and 87½ in. diameter respectively, and 5 ft. stroke, working at a boiler pressure of 160 lb. per square inch, and a piston speed of 700 ft. per minute. The difference in the longitudinal engine room space occupied by the new engines, as compared with that which would have been occupied by engines of the ordinary type, with the same diameter of cylinders and ordinary link motion, designed to occupy the shortest space consistent with having the crank shaft interchangeable, as in the present case, is over 4 ft., which in a ship of the dimensions of the City of Vienna represents a large and valuable increased cargo space, while with the new engines there is also the additional advantage of increased longitudinal main bearing surface, although there are fewer bearings, consequent upon the reduced length of the sole plate, every working part of the engines is open and free of access, the valves being on the cross center line of each engine, thus leaving a clear space from back to front between the engines.

Special attention has been given by the engineers to the design and finish of the whole engines, ample bearing surface having been provided in the working parts, with the means of easy and efficient lubrication available for the engineers in charge. The performance of the engines on the preliminary and official trials was in every respect highly satisfactory, a speed of fifteen knots per hour being attained, the engines working smoothly and no heating. At the conclusion of the trial the Messrs. Thomson were cordially congratulated on the success which had attended this new departure from their usual design and practice. Messrs. Thomson have in course of construction four sets of triple expansion engines, which are also to be fitted with Morton's patent valve gear.

Water Power and Electric Motors.

The census of 1880 placed the number of water wheels operating as motive power in the United States at 54,404. This tally represented a total of 1,225,379 horse power. The later association of water power with electric motors has developed a source of force that is destined to be of eminent service in industrial life. The distribution of this new energy by means of wires and motors over areas tributary to our water courses will add a new chapter to the story of industrial development. It has been computed on the best data obtainable that the rivers and streams of this country averaged throughout the year over 200,000,000 horse power. The electric utilization of this power opens a field of magnificent opportunities.

The Niagara project is in correspondence with the possibilities of this new energy in motive power. In Rochester, Kearney and Spokane Falls we have practical examples of its use.

The lower falls of the Genesee River are utilized by the Rochester Brush Electric Light Company, and it has 500 motors already in active service. It furnishes power to 108 tailor shops, charging at the rate of $18 per annum for one-eighth horse power. Fan motors are kept in continual motion from June 1 to October 1 for $15. For 25 cents a day a small manufacturer or storekeeper has one horse power at his service, with no trouble or care of his own. Its work is steady and continuous, and its easy command in small units at a nominal cost will make its use general and probably work some important changes in our industrial facilities.

The rate for two horse power is $120 per annum, $250 for five, $300 for six, $400 for eight, $475 for ten and $700 for fifteen. The power applied at these rates is economical and steady, and involves no attention beyond the closing of a switch, and that the work of a second. It can be carried any distance in large or small quantities.

The Ordnance Department of the national government is constructing a dam at Rock Island, Ill., in which some forty-one wheels, connected with dynamos, will carry the electric current to motors distributed in its various departments. The Des Moines rapids at Keokuk will furnish 60,000 horse power with the necessary machinery and appliances. There is practically no computable limit to the possibilities of this motive power, and its development will in time change many of the old and cumbersome conditions of our varied industries.—*The Age of Steel.*

THE new Croton Aqueduct, New York, was opened on the 15th July, and water from the Croton Lake, after running 30 miles, was admitted to the reservoir in Central Park. The opening of the new aqueduct is the cause of much rejoicing among the people. The supply of pure water will be much more abundant than it has been for ten years past.

A Electric Lawn Party.

Mr. Edward H. Johnson, the president of the Interior Conduit and Insulation Co., has a fine country residence, "Alta Crest," at Greenwich, Conn. His house is situated about four miles from the Sound, in the center of a plot of ground of 33 acres, which, according to the United States geographical survey, occupies the highest point of land between Maine and Florida, a like distance from the coast. On account of the electric light and the electrical proclivities of its owner, the place has been very appropriately named "Electric Hill." The house itself is of the colonial style, and from its spacious porticoes a magnificent view on all sides is spread before the observer. The lighthouse off Bridgeport shoals is plainly visible 33 miles distant—such is the vista. The house stands on the apex of the hill, and the broad winding driveway which leads up to it by a circuitous route is lighted by numerous incandescent lamps on ornamental poles. An Edison plant supplies the light and power for the house as well as for the spacious stables and lawns.

Within the house itself Mr. Johnson has carried out many novel ideas in regard to lighting as applied to decorative effects, as well as in regard to the useful application of electric power for household work.

In the groined, oaken hall a large handsomely finished organ pours forth melodious music by the hour, by the simple manipulation of an ordinary electric switch. An apartment over the *porte cochere*, known as Mr. Johnson's "Den," contains trophies from all parts of the civilized and uncivilized world. An electric cigar lighter lies handy to an open box of cigars on a table. Two electric cooking stoves keep the late supper warm, while an electric teapot simmers on the sideboard and has been found convenient in supplying other warm decoctions besides the five o'clock cup. A huge horned owl blinks electrically, with large yellow eyes, from his perch in one corner across the room at a hideous bearded Chinese mask, which emits the red fire of passion from its open eyes, mouth, and nostrils. Between the two is suspended in midair a large specimen of porcupine fish, within whose transparent and bristling skin is concealed an incandescent lamp sufficient by itself to light the room. Electric fan motors cool the air when necessary. On one side of the room stands what may now be termed a relic—one of the first phonographs ever made, a monument to tinfoil, lung power, and muscle; while on the other stands the very last instrument, especially constructed for Mr. Johnson, at the phonograph works. The drawers of the cabinet contain a choice selection of musical cylinders, which prove an endless source of entertainment to every one.

Lately Mr. and Mrs. Johnson received some 300 guests at their annual lawn party, given in honor of the birthday of their daughter. For this occasion a large dancing platform, 40 by 25 feet, was erected on the lawn in front of the house, covered with crash, and illuminated by strings of Chinese lanterns, each with an incandescent lamp within, suspended in festoons from decorated poles at the corners. Outside the house, the decorations consisted principally of artistic effects produced by an elaborate arrangement of incandescent lamps of all colors. Between each post of both the upper and lower porticoes encircling three sides of the house were suspended flexible pendants bearing alternate colored lamps of red, white, and blue, while from each of the third story windows hung lamps of like colors, and, surmounting it all, making one huge pyramid of light, was a varicolored cluster of lamps in the cupola.

From beneath the ivy which climbs thickly round about the stone tower containing the gun room and telephone room, peeped forth also many red and blue lamps. The flag poles, 75 feet in height, floated the stars and stripes, surmounted, not by the conventional eagle, but by a pin-wheel five feet in diameter, containing oven a dozen red, white, and blue lamps, and rapidly revolved by an eight horse power motor.

The engine room, with its two Edison dynamos, storage batteries, engines, and various regulating apparatus, proved to be a place of endless entertainment and instruction. The pumps operated automatically by Sprague motors, and forcing water from wells 1,200 feet distant, as well as the electrical dampers and other heat-regulating apparatus, automatically and electrically operated, were thoroughly inspected. The electric organ in the hall entertained great numbers, while the phonograph in the "Den," with its popular vocal and instrumental music, was the center of a delighted audience. The idea of lighting carriages by electricity, recently mentioned as new and just accomplished in England, has been in operation on Mr. Johnson's several carriages for a number of years, and was also illustrated. The feature of the evening, however, was a grand display of Pain's Manhattan Beach fireworks, which were ignited by electricity direct from the lighting circuit, a suggestion from Mr. Johnson, and something, we believe, never attempted before.

The fireworks, some one hundred and fifty yards from the house, were ignited from the piazza by the turning of a small electric switch in the hands of a lady. A tiny electric bell at her side gave the signal that all was ready; the switch was then pressed and the rockets and bombs exploded.

The *modus operandi*, as conceived and carried out by Mr. Johnson, was as follows: For skyrockets a battery (not electric) was constructed of six pieces of one inch tubing of the Interior Conduit Insulation Co.'s underground tube—another new application for this useful article. Upon the upper ends of each tube, which were cut squarely, were driven two French nails about one inch apart, one side of each set of nails connecting with copper wire to one pole of the circuit (taken from an adjacent lamp post) and the other side of each set to the other pole. Each pair of nails were connected by the simple winding about with a piece of fuse wire of small capacity immediately under the touchpiece of each tubed rocket. Accordingly each fuse was thrown directly across the line and all in multiple on the moment the switch on the piazza was made to close the circuit through a flexible cord across the lawn, thus effecting the simultaneous explosion of the rockets. The bombs and other pieces were touched off in a like manner, to the delight of an admiring audience. As the evening drew to a close all seemed reluctant to depart from this veritable fairy land.—*Electrical Engineer.*

CRYSTALLIZED ORNAMENTS.

A beautiful ornament, which is very easily made, consists of a wooden cross covered with Canton flannel,

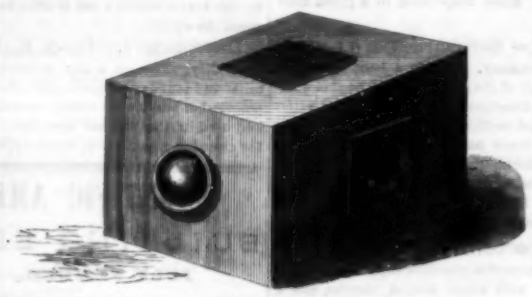


Fig. 1.—GROTTO.

with the nap side out, and crystallized by immersion in a solution of alum. The nap retains the crystals so that they are not readily loosened or detached. The flannel should be attached to the wood by means of brass wire nails, and the cross should be suspended in a solution formed by dissolving a pound of alum in a gallon of warm water. The cross should be suspended in the solution while it is still warm and allowed to remain in until the solution cools, when it will be found covered with bright crystals.

Fig. 1 is a perspective view, and Fig. 2 a longitudinal section of a grotto formed by crystallizing alum in a box containing jagged points covered with Canton flannel or wrapped about in various directions with

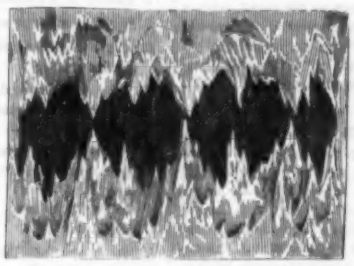


Fig. 2.—INTERIOR OF GROTTO.

coarse thread or twine. The box may be of wood or metal. It should have apertures in the top, ends, and sides. These apertures are stopped with corks, while the box is filled with the solution. After the crystallization the corks are removed, and the holes in the top, sides, and one end are covered with colored glass, and over the front aperture is secured a convex spectacle lens, having a focus about equal to the length of the box. When the interior of the box is illuminated by a strong light passing through the colored windows, the effect is fine.

The solution used in this case is the same as that given for the cross. After the crystals are formed and the liquid is poured from the box, the interior should be allowed to dry thoroughly before closing the apertures.

Celluloid Litigation.

Judge Lacombe of the United States Circuit Court for this district has lately rendered a decision adverse to the validity of the Hyatt patents, which cover the manufactures of celluloid. The substance known as celluloid consists usually of dissolved paper, although cotton or other vegetable fibers may be used. In the manufacture tissue paper is treated with nitric and sulphuric acids, the product is then washed and camphor added. The mass is then ground. Coloring matter is now added and the mass is made into a paste with alcohol, it is then pressed and broken between rolls. The finished mass is very plastic and may be moulded and pressed into any desired shapes, drawn into tubes, etc.

Patent—Corn Cob Pipe.

Judge Wallace, of the United States Circuit Court, sitting at Syracuse, N. Y., rendered an interesting decision in the case of H. Tibbe & Sons Manufacturing Company vs. Heineken. The suit was for the infringement of a patent on a corn cob pipe, and the court held that the defendant had infringed the plaintiff's patent by filling the cells which hold the corn on the exterior of the cob with cement from the outside. Judge Wallace said in giving judgment: "The claim of the plaintiff, Tibbe, is a new article of manufacture, a smoking pipe made of corn cob, in which the interstices are filled with a plastic, self-hardening cement. Upon first impression it would seem that the old 'Jackson pipe' is substantially the same thing as the pipe of the present patent. But that was a corn cob pipe in which the inside of the bowl was lined with a plastic cement to fireproof it, whereas the pipe of the patent is one in which the interstices of the cob are filled with cement. These interstices, or cells, which hold the corn are on the exterior of the cob, and although in some instances they could be filled from the inside of the bowl, that would not be a practical way of filling them, and when cobs of large or medium size are used for the bowl, as they generally are, the interstices can only be filled from the outside. The specification is addressed to those skilled in the art, and the claim is to be interpreted, as its language naturally imports, as one for a pipe in which the exterior interstices of the cob are filled with a plastic cement. Such a pipe supplies a sweet and porous receptacle for tobacco, having characteristics which are well understood by smokers to be desirable, and is a very different thing from one with a cement-lined bowl. It did not involve invention of any high order to make such a pipe, but there was enough to convert a poor article into a good one, and supply something to the trade which was new and the merits of which were immediately and generally recognized. If the defendant chooses to sell the old 'Jackson pipe,' he is at liberty to do so, but he has appropriated the rights of the complainant by selling the pipe of the patent and must take the consequences."—*Bradstreet's.*

New Route across the Atlantic.

An Ottawa, Can., dispatch states that a company of Boston, Mass., capitalists has been quietly developing the foundations of a seaport at the east end of the Straits of Canso, N. S., and if expectations are realized it will have an important bearing upon future communication between Europe and America. The place, which is to be called Terminal City, is five miles east of Port Mulgrave, on the Intercolonial Railway, and the government has consented to an extension of the railway to the place, and agreed to operate the extension as part of the Intercolonial system. Terminal City is situated on one of the finest harbors on the Atlantic coast, having sufficient depth of water for the largest vessel afloat, being completely land-locked, absolutely free from ice, comparatively free from fog, and open to navigation at all times. A straight line on the map of the world from Chicago to Liverpool passes through this point, and the distance between them is 400 miles shorter than by Portland, Boston, or New York. It will take four days from Terminal City to Liverpool by the new steamers proposed to be put on the route. When the railroad is completed and wharves are built, all passengers and mails from Europe will be delivered in New York or Montreal one day sooner than by any other route. It is the most easterly port, open all the year round, and appears to be a natural shipping port for the products of the Dominion to Europe.

High Rates of Speed.

One of our correspondents not long ago asserted that a speed of 100 miles an hour by steam locomotives was entirely practicable, and thought it would be attained. In a recent lecture before a scientific club, Professor Elihu Thomson declared that much higher speeds than can now be obtained with steam locomotives are to be expected by means of electricity, and he considered from 100 to even 150 miles an hour possible. While in the steam locomotive there are reciprocating parts that must be put in motion, stopped, and reversed continually, in the electric locomotive we have simply a rotary motion, which makes it possible to run with economy at much higher rates of speed. He believed that if we could come back after another hundred years, we would find 150 miles an hour to be the speed of traveling, adding, "It simply depends upon finding the necessary method of applying sufficient power, and building the locomotives to suit, arrangements being adopted to keep the cars on the track." One hundred and fifty miles an hour may be among the possibilities, but probably most people nowadays would rather leave to coming generations the enjoyment of whirling through space at that frightful velocity. To leave Chicago at night and be in New York next morning would be a wonderful achievement, involving great increase of business facilities, but the safety of such a speed under present conditions may well be questioned.—*Railway Age.*

RECENTLY PATENTED INVENTIONS.

Engineering.

SAFETY VALVE. — William C. Walda, Fort Wayne, Ind. The valve body of this device has a central valve seat and line pipe openings leading through the side walls of the seat, with a gravity valve held open by the pressure and fitting in the seat, extending past and closing both openings, the valve being simple and durable and designed to automatically close a pipe when the pressure within ceases.

REGISTER FOR ENGINES, ETC. — Rudolph Ruhlman, Trenton, N. J. This is a mechanism which has its counting or numbering wheels actuated by direct mechanical movement without the use or aid of springs, for registering the revolutions of steam engines or other machinery, and is designed to be very simple, durable and effective.

FLUE DUST COLLECTOR. — Bernhard Ruoing, Friedrichshutte, near Tarnowitz, Prussia, Germany. This invention covers a system of separate depending wires suspended in the customary flue dust chambers, in line with the current of the fumes, to collect the solid particles of the smoke or fumes of silver, lead, copper, or other metallurgical furnaces, in distinction from the gaseous constituents of the smoke or fumes.

DOUBLE ACTING PUMP. — Joseph M. Clark, Colfax, Washington. This is a pump in which as one plunger moves downward the other moves upward, so that a continuous stream of water is forced through the outlet pipe, the plungers working in the upright parts of a U-shaped barrel which can be readily taken apart to get at the valves and clean the barrel.

Railway Appliances.

CAR COUPLING.—William Yates, New York City. This coupler has a spring-actuated drawbar provided on its forward edge with a locking shoulder and on its rear edge with a boss, in line with which extends a crank with a forwardly projecting arm, a slotted rod connecting this arm with the drawbar, the device being designed to be thoroughly automatic in coupling, and to be operated from the top and sides of the car.

CAR COUPLING. — Milford R. Harries, Greensborough, Ala. This invention consists of a counterbalanced lever fulcrumed in the drawhead, which has a slot in its bottom, and adapted to support the link in or about in a horizontal position, the invention also covering novel details and combinations of parts, designed to afford a simple, durable, and very effective construction.

Mechanical.

SAW MILL FEED. — Harvey Segur, Decatur, Ind. In connection with the carriage is employed a cable and drum with operating mechanism, the drum having a gear wheel with which meshes a gear on the shaft of a friction pulley, the friction pulley being rotated in one or the opposite direction by means of two friction drive pulleys which are rotated in opposite directions, and so supported that either one may be moved into engagement with the friction wheel.

MACHINE FOR FORMING AND ROLLING SEAMLESS TUBES.—Lyman White, Waterbury, Conn. Two patents have been issued to this inventor, one providing a roll which will simultaneously lengthen, feed, and properly shape a seamless tube from a cylindrical casting, with a simple, compact and durable machine adapted for use in connection with the rolls, while the other provides a machine with a series of rolls adapted for attachment thereto for reducing and lengthening the castings to produce a perfect tube, the invention consisting in the combination and construction of the several parts of the machine adapted to carry the rolls.

Agricultural.

FRUIT GATHERER.—George W. Blackburn, Sarasota, Fla. In connection with the cutter and conducting tube, a novel form of garment is to be worn by the operator, adapted to form receptacles for the fruit, whereby the fruit may be assorted as picked and carried conveniently on the person, the stem being cut close to the body of the fruit without injury from the cutter.

COTTON HARVESTER. — John H. Masters, Stockton, Cal. This invention provides a machine that is designed, when driven over the rows of plants, to blow the cotton from the bushes, the blast carrying the cotton through a suitable nozzle and into a bag or other receptacle, frictional contact aiding the blast in the case of tall plants.

Miscellaneous.

PRINTING TELEGRAPH. — William W. Taylor, Mansfield, Mass. This invention provides for an arrangement of keys similar to those of a typewriter, and so constructed that a single tap upon one of the keys will transmit the whole letter or character in dots and dashes and in print, these keys being connected with a typewriter at each end of the line in such a manner that when the keys are operated the typewriters will be operated also.

FORMING RINGS.—Joseph B. Bowden and Hermann V. Bernhardt, Brooklyn, N. Y. This invention covers a method of first forming a ring with a decreasing thickness from the inside to the outside, and then subjecting it to the action of a series of graduated swages, to insure uniform density and prevent detrimental undue compression and expansion during the several operations.

MAKING BOTTLES. — John B. and Robert Johns, Findlay, Ohio. To cheaply make bottles, this invention provides a method of forming a ring near the upper end of the bottle neck at the time the bottle body is blown, at the same time producing recesses in the peripheral face of the neck just below the ring, and finally applying the bottle head, making a bottle to which the lever of a stopper ball can be quickly and easily secured.

CALCULATOR FOR PERCENTAGES. — Edwin B. Dennis, Excelsior, Mich. Combined with an open top box having its back extended below the bottom, and with a series of numbered recesses, is a peg adapted to fit in the recesses, a series of sliding bars in the box, and a series of slips removably secured to the bars, designed to be a simple and durable device for rapidly and accurately calculating the percentage on a certain sum.

FLUE PROTECTOR.—Joseph H. Gilbert, Philadelphia, Pa. Combined with a masonry chimney is a rectangular surrounding band projecting above and below the floor line, with a box around the band of about the same height as the floor joists, whereby sparks from the interior of the chimney cannot pass through interstices between the bricks into the space between the ceiling and the floor, or behind the base boards.

HOSE REEL. — Reuben D. Wirt, Independence, Mo. This is an improvement on a former patented invention of the same inventor, in which a foot rest and a handle made of gas pipe and united by couplings were used to give lightness and strength, the present device being cheaper, and having running wheels or rollers independent of the reel proper, in which an ordinary cross arm reel may be used.

HEATING AND SETTLING BRINE, ETC. —Powhatan P. Truehart and Milton S. Kimball, Sterling, Kansas. This invention relates to apparatus for separating the impurities from salt brine, sugar cane juice, and other liquids, to utilize the waste heat from under the evaporating pan for heating and settling the brine, separating the impurities, so that the brine shall flow into the evaporating pan hot and pure, whereby the settling and heating will be economically effected and the quantity of brine evaporated in a given time greatly increased.

SHOE LAST. — Bernhard Thorner, Leipsic, Saxony, Germany. This is a boot and shoe last designed to admit of the stretching of a boot or shoe upper in all desired directions by the use of the same last, which is divided vertically and horizontally into four parts, the two lower parts being hinged at their heel ends to swing horizontally apart at the toes, and the upper parts or instep members being hinged at their forward ends to the lower members to swing vertically, with an operating mechanism.

BRICK PROTECTOR. — Nils Olson, Superior, Wis. This invention provides supporting standards carrying caps with wings hinged thereto, and a means of raising the wings, the protectors being arranged in sets or series, for protecting moulded but unbaked brick in case of a sudden storm, where boards and portable sheds have been heretofore employed.

PETROLEUM STOVE. — Olivier Proust, Paris, France. Combined with a metal fount having a central tube projecting through its bottom, is a surrounding casing of non-conducting material forming an air space, and having openings near its bottom, with other novel features, designed to utilize the fuel to the best advantage and insure absolute safety.

ALBUM. — Christian Jaeger, New York City. Two patents have been granted this inventor, one being an improvement on his own former patented invention, and combining a stand provided with a foot piece and back with a book having a bottom hinged to the foot piece and backs connected to the book bottom or cover, with leaves alternately connected to the backs and arranged to interlock, while the other provides a book pivoted by one of its covers to the stand, with a simple and durable construction to permit of opening the leaves of the book and inserting the pictures without injury to the book or stand, as is frequently the case with easel albums as now constructed.

HARNESS FOR OXEN OR OTHER CATTLE.—Otto R. Gottwald, Sayville, N. Y. This harness consists essentially of a head piece with straps for attachment to the horns, a saddle with a belly girth and with loops upon its side, with traces attached to the ends of the head piece and extending through the loops, making a simple and easy harness, readily applied, that will not restrict the movement of the animal, and enable a much greater load to be drawn than can be done with the devices ordinarily in use.

ANIMAL SHEARS.—Chester M. Palmer, Lamartine, Wis. This is a device for sheep shearing, horse clipping, etc., adapted to be operated by an electrical motor, the arms or supports consisting of an electrical horse shoe magnet, an operating shaft being journaled between the arms of the magnet and carrying an armature at one end, its opposite end being connected to the cutter bars in such manner that the revolving motion of the shaft will impart a reciprocating motion to the cutters.

ANIMAL CLIPPER. — This is another patented invention of the same inventor for an improved construction and combination of parts of a similar tool, whereby, from a source of electrical supply, an arm is caused to vibrate rapidly and properly operate the reciprocating cutter bar, the device to be grasped by the hand, the wires extending along the arm and to a belt around the waist, thence to a spring hanger on the ceiling and to the battery.

WHETSTONE FOR ANIMAL CLIPPERS. —This is a multiple whetstone patented by the same inventor for sharpening the V-shaped edges of the knives of clippers, the arrangement being as a series of parallel bars in which the body of the stones have an inclination to one side of a vertical line and the whole bed is mounted pivotally so as to be reversed to reverse the inclination of the stones.

UPHOLSTERER'S WEB STRETCHER. — William E. Morton, Flushing, N. Y. This is an implement with two members pivoted to swing laterally, with circular racks on the contacting faces of their pivoted ends, and a locking device, and adapted to be employed to advantage in securing strips of webbing at each side of a line drawn through the center of a chair seat or other frame of circular or semicircular contour.

DOOR CHECK. — Myron W. Ward, Concordia, Kansas. This is a combined door stop and holder, simple in construction and very durable, being formed only of a strong spiral spring and two ordinary screws, and designed to stop the door gently and without noise, and also to hold it open, being applicable also to swinging doors.

POOL TABLE. — William H. Violett, Grand Junction, Col. Combined with the pockets are inclined stationary carriers terminating in a single pipe, with racks arranged for one to each player, and a movable tube or carrier adapted to connect the single pipe with any one of the racks, and various other novel features, including a device for reception of balls and noting of count from "scratch" shots.

BUBBLE PIPE. — Alonzo Lewis, Baltimore, Md. This pipe has a reservoir in connection with a rubber outlet pipe having a clamp or compression engaging it transversely to close its bore by compression, means for releasing the clamp, and a blowpipe communicating with the rubber tube below its clamp, the device holding the water so it will not be spilled.

SHOULDER BRACE CORSET. — Andrew J. Bobbs, Cincinnati, Ohio. This invention covers corset braces with a broad, stiff back piece and elastic arm loops, with a waist belt at the bottom, suspender straps being attached to the sides of the back piece behind the arms, and passing obliquely along the loins for connection with the trousers on each side near the front, whereby the strain is brought on the back piece near the middle.

PERFUME HOLDER.—Herman Tappan, New York City. This is a device designed to prevent breakage of the bottle or flask, while being highly ornamental, and comprises a base supporting the bottle and provided with a neck holding a collar, bent rods being hooked on the base and the collar forming a guard for the bottle, while a cap is held on the bottle and engages the collar.

DETERGENT.—Peter K. Post, Jr., New York City. This is a new article of manufacture for toilet and laundry purposes and other uses, and is compounded of borax with spirits, to make a paste, prepared and used in the manner specified. It is also designed for cleaning glass, silver, crockery, etc.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2356) A Subscriber writes: Will you please state whether steam is visible? A. Steam is invisible. The white cloud seen escaping from steam pipes, kettles, etc., is not steam, but is water in a finely divided state.

(2357) H. H. H. asks (1) if in making wood alcohol and acetic acid they are made from the same product, or if only one of these can be made from the same extraction? A. They are made in the same extraction by distillation of wood. 2. Is turpentine made in any other way in this country than from the exuded sap of the pines? A. In Knight's Mechanical Dictionary you will find described under the article turpentine still an apparatus for direct manufacture of turpentine. Comparatively little is thus produced. 3. Is there any place in this country where acetic acid, turpentine and wood alcohol are all gotten from the same extraction of wood, that is, given say 2 gallons of wood tar, is there any manufactory that will take from this 2 gallons the turpentine, the alcohol and acid? A. Wood tar is not generally thus treated, as it would be very poor economy to first distill the wood destructively and then recover from the tar the other products. We cannot undertake to supply the statistics asked for.

(2358) J. P. L. asks the object in mixing sea coal with sand, thus making what they call a facing for patterns? A. To prevent the sand from fusing into the iron and forming a hard scale.

(2359) C. F. M. asks the composition of a good liquid cement. A. Soak gelatine in water, melt at a low heat and add strong vinegar or acetic acid until it remains liquid when cold.

(2360) L. G. E. writes: I want some formulas for brilliant color for drug store show bottles. A. For violet use sulphate of iron with salicylic acid, for yellow chromate of potash, for dark green chromium sulphate, for red sesquichloride of iron with sulphocyanide of ammonium, for blue sulphate of copper and ammonia.

(2361) A. E. C. asks for a recipe for making a shampoo cream. We give three formulæ:

1.

New England rum	1 pint.
Bay rum	¾ "
Glycerine	2 oz.
Carbonate of ammonia	1 "
Borax	2 "

2.

Carbonate of potash	2 oz.
Bay rum	2 "
Rose water	1 pint.
Water	1 "

3.

Carbonate of ammonia	½ oz.
Carbonate of soda	½ "
Rum	½ pint.
Water	1 "

(2362) K. asks: 1. Is the platinum plated or soldered on the platinum faced battery connections? A. Soldered. 2. Can platinum sheet be soldered to lead and iron, and if so, how? A. Platinum is generally attached by means of soft solder, using the ordinary zinc chloride solution as a flux.

NEW BOOKS AND PUBLICATIONS.

FRUITS AND HOW TO USE THEM. A practical manual for housekeepers. By Mrs. Hester M. Poole. New York: Fowler & Wells. 1890. Pp. 242. Price $1.

Fruit as food is the theme of this book. The authoress seems to be an enthusiast on the subject of healthful living, and certainly appears to have succeeded in condensing in the present work a vast number of useful receipts for the preparation of fruit for the table.

SPON'S TABLES AND MEMORANDA FOR ENGINEERS. By J. T. Hurst, Mem. Soc. Eng., Mem. Phys. Soc. London, Surveyor War Department, author of "Architectural Surveyor's Handbook," "Hurst's Tredgold's Carpentry," etc. Tenth edition. New York: E. & F. N. Spon. 1889.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 15, 1890,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Actuating mechanism, system of, J. H. Dixon ... 432,158
Adding machine, W. M. Fitzwater ... 432,308
Adding machine, G. B. Fowler ... 432,306
Alarm. See Burglar alarm.
Album, C. Jaeger ... 432,410, 432,411
Alcohol, purifying crude, G. Guignard ... 432,198
Animal shears, C. M. Palmer ... 432,432
Animal trap, J. C. Kerns ... 432,139
Animal trap, M. S. Miller ... 432,493
Arc light circuits, regulation of, D. Higham ... 432,310
Armature, E. Wagemann ... 432,500
Armature of dynamo-electric machines, O. A. Enholm ... 432,387
Automatic sprinkler, A. F. Nagle ... 432,166
Automatic ventilator, Furey & Thomas ... 432,395
Axle box, carriage, A. G. Hill ... 432,199
Axle mounting, M. A. Andrews ... 432,109
Baby walker, A. C. Davidson *et al* ... 432,378
Bag. See Paper bag.
Baking pan, G. W. Lisk ... 432,315
Bar. See Claw bar. Cutter bar.
Basins, overflow and waste for set, C. A. Blessing 432,232
Bedstead, cabinet folding, B. Poulson ... 432,073
Bell, door, F. Sanderson ... 432,385
Bell, door, W. L. Upson ... 432,344
Belt fastener, C. R. Weide ... 432,104
Belts, machine for folding abrasive, G. A. Fullerton ... 432,090
Bevel, J. S. Brooks ... 432,367
Bicycle pedal, C. E. Duryea ... 432,126
Billiard cue tip, C. Rausch ... 432,330
Bit stock, L. L. Davis ... 432,180
Blacking and brushing machine, boot and shoe, W. S. Badger ... 432,006
Blind sliding window, G. Poppert ... 432,320
Boiler. See Fruit boiler. Wash boiler.
Boiler, C. O. Toole ... 432,456
Boiler furnace, steam, J. Grosty ... 432,402
Bolt cutting machine, E. Goldthwait ... 432,035
Bookmark, E. W. Harding ... 432,096
Bookmark and leaf holder, combined, W. C. Martineau ... 432,189
Boot or shoe clasp, C. C. Hazelton ... 432,041
Bottles, making, J. B. & R. Johns ... 432,412
Box. See Axle box. Journal box. Letter box. Paper box.
Brake. See Car brake. Cart brake.
Brake shoe, W. Lawrence ... 432,277
Brick protector, N. Olson ... 432,430
Bridge gate, A. W. Buel ... 432,016
Brine, etc., apparatus for heating and settling, Trosheart & Kimball ... 432,457
Broom, E. H. Fenton ... 432,130
Bubble pipe, A. Lewis ... 432,415
Buckets, cans, etc., cover for, J. H. Brinkop ... 432,474
Buckle, M. J. Robinson ... 432,147
Buckle, suspender, Baum & Ulman ... 432,208
Bulkhead door, watertight, Paterson & Cumming 432,070
Bundle carrier, F. Palm ... 432,008
Bureau, etc., D. C. Clapp ... 432,371
Burglar alarm, J. H. Pruitt ... 432,077
Burner. See Gas burner. Hydrocarbon burner. Vapor burner.
Butter making, L. Guinnip ... 432,235
Button attaching machine, C. J. & C. W. Coleman 432,375
Button or stud, F. E. Williams ... 432,219
Button setting machine, C. J. Coleman ... 432,374
Calculator for percentages, E. B. Dennis ... 432,380
Cam, J. Cryderman ... 432,301
Camera stand, H. D. Waltz ... 432,235
Can. See Jacketed can. Oil can.
Car brake, F. Feldhaus ... 432,129
Car brake, J. F. McLaughlin ... 432,303
Car barke, motor, H. A. Crossley ... 432,090
Car construction, G. L. Harvey, 432,272, 432,273, 432,275, 432,276
Car coupling, W. J. Harkness ... 432,039
Car coupling, M. B. Harriss ... 432,135
Car coupling, H. H. Schoonover ... 432,087
Car coupling, W. Yates ... 432,470
Car draw gear, G. L. Harvey ... 432,274
Car, electric, E. Wagemann ... 432,501
Car, electric motor, J. F. McLaughlin ... 432,308
Car, freight, W. W. Green ... 432,487
Car heater, G. A. Houston ... 432,398, 432,399
Car heating apparatus, A. B. Wilson ... 432,349
Car, metallic, C. T. Schoen ... 432,086
Car, railway, L. P. Farmer ... 432,205
Car, street, J. A. Brill ... 432,115
Cars, adjustable fender or guard for street, H. B. Lent ... 432,143
Cars, draught and buffing mechanism for railway, Coulter & Hibbert ... 432,376
Cars or other structures, door for, Coburn & Sumner ... 432,225
Carbon conductors, manufacture of, A. De Khotinsky ... 432,400
Carburetor, G. Hargreaves *et al* ... 432,270
Carding engines, etc., coiler for, G. T. Francis ... 432,132
Carriage and sleigh, combined, J. S. Gourlay ... 432,208
Carriage, child's, G. Marqua ... 432,402
Carriage, child's, J. H. & W. Toser ... 432,097
Carrier. See Bundle carrier. Grain carrier.
Cart brake, C. W. Young ... 432,319
Case. See Eyeglass case. Mailing case.
Cash drawer recorder, F. R. Woodward ... 432,468
Cash indicator and register, R. W. Uhlig ... 432,099
Cash recording device, G. M. Enyeart ... 432,388
Cattle guard, surface, F. C. Balch ... 432,175, 432,194
Center and mortise gauge, J. A. Painter ... 432,328
Chain, drive, D. J. Sheldrick ... 432,089
Chair. See Folding chair.
Chair, O. E. Michaud ... 432,423
Channeling machine, M. Griffin ... 432,161
Chart, genealogical, O. W. Rogers ... 432,149
Chopper. See Cotton chopper.
Churn, J. Gifford ... 432,092
Cider press, D. Whiting ... 432,153
Cigar lighter, electric, R. Graham ... 432,197
Circuits, apparatus for detecting short, H. Redding ... 432,215
Clasp. See Boot or shoe clasp.
Claw bar, F. P. Craig ... 432,299
Clay slug, apparatus for rounding plastic, S. C. Dyke ... 432,127
Cleaner. See Pulp screen cleaner.
Clipper, animal, C. M. Palmer ... 432,433
Clipper sweat guard, hair, J. K. Priest ... 432,076
Cloth finishing machines, mechanism for guiding the edges of webs to, Shortle & Leitch ... 432,494
Clothes line prop and stretcher, C. C. McClaughry 432,429
Clothes line pulley, F. P. Skornicki ... 432,334
Clothes wringer, A. L. Slager ... 432,495
Clothes wringer, T. W. Stone ... 432,252
Clutch, electric, J. F. McLaughlin ... 432,309
Clutch, friction, J. W. Blodgett ... 432,473
Clutch, friction, E. S. Capen ... 432,179
Clutch operating mechanism, W. J. Parmelee ... 432,069
Clutch, pulley, E. Waldron ... 432,102
Coal breaking machine, Simpson & Alvord ... 432,446
Cocoanut oil, refining, A. Smith ... 432,251
Coiled steel spring, I. A. Timmis ... 432,341, 432,342
Coin-actuated device, P. Kennedy, Jr ... 432,163
Collar fastener, horse, B. O. Smith ... 432,088
Commutator brush, J. F. McLaughlin ... 432,306
Cork machine, C. Nelson ... 432,212
Corset, B. Viau ... 432,171
Corset, shoulder brace, A. J. Bobbs ... 432,368
Cotton chopper, W. E. Lindsay ... 432,057
Coupling. See Car coupling. Shaft coupling. Thill coupling.
Crane and weighing apparatus, combined, J. A. Potter ... 432,072
Crate, W. Hall ... 432,405
Cultivator, W. Davis ... 432,021
Cultivator, A. Ellis ... 432,126
Cultivator, D. D. Funk ... 432,031
Cultivator, C. H. Taylor ... 432,452
Cultivator feeder, E. C. Holladay ... 432,047
Cup. See Dope cup.
Current regulator or rheostat, O. Flemming ... 432,131
Current regulator or rheostat, G. B. Massey ... 432,279
Cutter head, A. M. Moore ... 432,321
Cutter bar, E. T. Sheppard ... 432,445
Dehorning device, H. W. Leavitt ... 432,056
Desk, etc., school, Merrill & Lina ... 432,319
Detergent, P. K. Post, Jr ... 432,437
Die. See Wire drawing die.
Dope cup, P. G. Van Wie ... 432,100
Door actuating device, D. McVean ... 432,006
Doors, automatic apparatus for opening and closing, A. McWilliams ... 432,310
Door check, T. Goodenough ... 432,485
Door check, M. W. Wirad ... 432,466
Door fastening, A. Brunner ... 432,178
Door hanger, C. A. Reynolds ... 432,247
Door securer, G. G. Baker ... 432,009
Door spring, G. Focht ... 432,037
Door spring, A. D. Goodwin ... 432,308
Drawer guide for bureaus or like articles of furniture, D. C. Clapp ... 432,372
Drill. See Grain drill.
Drying machine, Proctor & Knowles ... 432,282
Dust arrester, E. W. Hoover ... 432,200
Dust collector, O. Kutsche ... 432,491
Dust collector, A. N. Wolf ... 432,250
Eggs, composition for preserving, S. C. Matteson. 432,060
Electric energy, means for generation and conversion of, A. De Castro ... 432,022
Electric heater, J. F. McLaughlin ... 432,305
Electric locomotion, means for, J. F. McLaughlin 432,304
Electric machine, dynamo, F. A. Perret ... 432,160
Electric meter, P. H. Korst ... 432,053
Electric switch, A. C. Frey ... 432,034
Electric switch, J. F. McLaughlin ... 432,307
Electrode, secondary battery, J. F. McLaughlin .. 432,302
Elevator. See Sucker rod elevator.
Elevator safety device, P. Schmidt ... 432,443
Engine. See Gas and air engine. Hydrocarbon engine. Piston engine. Pulp engine.
Engine attachment, steam, C. F. Baker ... 432,111
Excavating apparatus, H. Cassbolt ... 432,116
Explosive compound, S. D. Smolianinoff ... 432,336
Extractor. See Stump extractor.
Eyeglass case, C. F. Prentice ... 432,314
Fanning mills, air blast regulating device for, J. S. Ady ... 432,353
Faucet attachment, Van Alstine & Munser ... 432,152
Feed beater, rotary, F. F. Guetha ... 432,186
Feedwater heating and purifying apparatus, R. Learmonth ... 432,055
Feedwater purifier, B. F. Field ... 432,026
Fence post holder, L. Heiland ... 432,043
Fences, machine for making stay pieces and guards for wire, Duncan & Willard ... 432,123
Fender. See Cultivator fender.
Fertilizer, phosphatic, J. D. Simmons ... 432,091
Fire apparatus, locked joint for, F. Grinnell ... 432,408
Fire escape, J. F. Hill ... 432,045
Fire escape, block tackle, J. A. P. Hopting ... 432,044
Fire extinguisher, A. Durand ... 432,481
Fire extinguisher, automatic, F. Grinnell ... 432,404
Fire extinguisher, chemical, A. Durand ... 432,482
Flue dust collector, B. Rosing ... 432,440
Flue protector, J. H. Gilbert ... 432,397
Folding chair, L. A. Chichester ... 432,478
Folding table, W. J. Moan ... 432,425
Form table, adjustable, S. G. Goss ... 432,034
Frame. See Pocket frame. Wagon frame.
Friction grip, intermittent, W. H. Wild ... 432,348
Fruit boiler, A. W. Miller ... 432,320
Fruit gatherer, G. W. Blackburn ... 432,362
Furnace. See Boiler furnace. Metallurgical furnace.
Fuse cap fastener, N. W. Moodey ... 432,427
Gauge. See Center and mortise gauge.
Game, G. Scott ... 432,170
Game, H. Shrimpton ... 432,267
Game apparatus, W. C. Dunn ... 432,160
Game apparatus and sample exhibitor, F. H. Smith ... 432,447
Game puzzle, W. H. Fitler ... 432,483
Garment fastener, W. A. Barnard ... 432,117
Garment pattern, adjustable, J. H. Moriarty ... 432,322
Gas, apparatus for producing highly heated, R. F. Nenninger ... 432,361
Gas and air engine, G. B. Brayton ... 432,114
Gas burner, regenerative, T. Gordon ... 432,399
Gas holder, E. L. Pease ... 432,434
Gases and liquids to moving vehicles, device for supplying, L. J. De Puy ... 432,121
Gate. See Bridge gate.
Gate, J. G. Barber ... 432,354
Gate, J. S. Kurtz ... 432,314
Gearing, changeable speed, Martin & Heath ... 432,418
Gem setting, G. Armeny ... 432,007
Generator. See Steam generator.
Grain carrier, W. H. Knapp ... 432,052
Grain cooling and drying apparatus, A. McDougall ... 432,145
Grain drill, A. J. Martin ... 432,417
Grain separator, E. E. Chapman ... 432,370
Grain separator, S. E. Chase ... 432,117
Graphophone, J. H. White ... 432,462
Grate, A. C. Fletcher ... 432,394
Guard. See Cattle guard. Clipper sweat guard. Loom shuttle guard. Snow guard.
Halter, J. Knight ... 432,414
Handle. See Tool handle.
Hanger. See Door hanger. Shaft hanger.
Harness for oxen or other cattle, O. R. Gottwald. 432,400
Harrow, J. T. Greenwood ... 432,185
Harrow, revolving, J. Shepherd ... 432,286
Harvester, corn, Galt & Tracy ... 432,184
Harvester, cotton, J. H. Masters ... 432,430
Harvester reel, J. E. Hudson ... 432,048
Hat and coat rack, C. T. Gardner ... 432,484
Heat, method of and means for applying the expansive power of, J. R. Fraser ... 432,182
Hat screen, M. Thurston ... 432,340
Heater. See Car heater. Electric heater. Hot air ventilating heater. Vehicle heater.
Heel burnishing machine, C. J. Addy ... 432,471
Hinge, window sash, G. D. Crocker ... 432,119
Holder. See Fence post holder. Gas holder. Horse tail holder. Paper holder. Pen holder. Perfume holder. Pillow sham holder. Trace holder.
Hook, J. H. Templin ... 432,288
Horse rake, P. Blaker ... 432,112
Horse tail holder, R. G. Sayle ... 432,085
Hose reel, R. D. Wirt ... 432,467
Hot air ventilating heater, C. B. Loveless ... 432,188
Hydrocarbon burner, S. C. Reilly ... 432,080
Hydrocarbon engine, G. B. Brayton ... 432,260
Ice harvesting machine, J. A. Mengel ... 432,421
Inclines, etc., safety device for, W. Peach ... 432,313
Indicator. See Cash indicator. Letter box indicator.
Induction coil or transformer, C. E. Kammeyer ... 432,050
Ingots and seamless wire, manufacture of hollow plated metal, H. T. Smith ... 432,496
Inkstand stopple, Brooder & Thomas ... 432,015
Iron. See Sad iron.
Iron ore, reducing, C. J. Eames ... 432,389
Jack. See Lifting jack. Nailing machine jack.
Jacketed can, S. Walter ... 432,346
Joint. See Pipe joint. Rail joint.
Journal box, A. D. Cox ... 432,156
Jute bagging, making, A. & B. Grats ... 432,401
Kettle, A. C. Nunn ... 432,067
Kettle attachment, L. W. Buxton ... 432,017
Knitting machine, circular, J. S. Kern ... 432,051
Knitting machine stop mechanism, J. Stewart ... 432,450
Ladder, W. Dilts ... 432,263
Lamp, W. M. Hoerle ... 432,489
Lamp, A. Taplin ... 432,339
Lamp, central draught, C. A. Evarts ... 432,264
Lamp, central draught, W. M. Hoerle ... 432,311
Lamp, electric arc, E. C. Russell ... 432,284
Lamp, pocket, S. W. Evans, Jr., *et al* ... 432,304
Lamp support, extension, C. Maschmeyer ... 432,278
Lathing, metallic, C. Kinney ... 432,141
Lawn rake and grass carrier, combined, O'Neill & Linstrom ... 432,168
Letter box, W. O. Taylor ... 432,264
Letter box indicator, H. B. Griffiths ... 432,206
Lifting jack, E. Covert ... 432,230
Lock. See Nut lock.
Locomotive, electric, W. H. Knight ... 432,142
Locomotive machinery, J. W. Shinn ... 432,090
Locomotive, multiplex electric, C. J. Van Depoele ... 432,245
Locomotives, exhaust nozzle for, F. Mertaheimer. 432,422
Loom, H. Hodgson *et al* ... 432,046
Loom harness mechanism, M. Healy ... 432,042
Loom, self-threading shuttle, J. H. Nason ... 432,167
Loom shedding mechanism, E. Weibel ... 432,460
Loom shuttle guard, T. J. Benson ... 432,357
Loom temple, E. Hamilton ... 432,187
Lubricant, R. Hutchison ... 432,313
Lumber strip, A. Meigs ... 432,245
Mailing case, G. E. Taylor ... 432,263
Mat. See Wire floor mat.
Measuring device, grain, C. A. Wever ... 432,347
Measuring vessel, Bachelder & Lovejoy ... 432,353
Meat cutting machine, S. T. Jull ... 432,242
Mechanical movement, C. C. Emmons ... 432,386
Mechanical movement, McNeal & Runnells ... 432,192
Medicine, remedy for dyspepsia, P. L. Brault ... 432,466
Metal upsetting machine, W. P. Bettendorf ... 432,360
Metallurgical furnace, R. F. Nenninger ... 432,280
Meter. See Electric meter.
Middlings purifier, C. E. Henshaw ... 432,482
Mining machine, coal, J. L. Beury ... 432,264
Moulding machine, F. Kepp ... 432,243
Motor. See Steam motor.
Mower attachment, lawn, R. R. Grimes ... 432,307
Mower, lawn, Slager & Linn ... 432,092
Mowers, grass catching attachment for lawn, W. C. McQuillon ... 432,005
Music leaf turner, De Loss & Mears ... 432,120
Music stands, instrument holder for, G. H. Foley. 432,396
Muzzle for horses, H. Lowe ... 432,317
Nail driving tool, W. B. Brady ... 432,113
Nail extractor, M. D. Converse ... 432,019
Nailing machine, box, J. Casey ... 432,477
Nailing machine jack, P. H. Pratt ... 432,074
Nut lock, F. O. Boswell ... 432,014
Nut locks, making, J. C. Richardson ... 432,081
Oil can, safety, G. W. Cook ... 432,220
Packing, metallic, W. I. Page ... 432,327
Pails, etc., ears for securing bails to, H. L. Ferris. 432,191
Paint compound, Jackson & Neal ... 432,240
Paint, transparent water color, R. T. Swenning ... 432,151
Pan. See Baking pan.
Paper box, J. M. Guilbert ... 432,208
Paper box, R. P. Brown ... 432,175
Paper cutting machine, C. Seybold ... 432,088
Paper holder and cutter, roll, J. A. Eastin ... 432,384
Paper holder and cutter, roll, W. E. Nott ... 432,246
Paper holder and cutter, roll, G. E. Yarger ... 432,107
Paper vessels, machine for forming, W. Foglesong ... 432,098
Paper vessels, machine for making, W. Foglesong 432,099
Pattern. See Garment pattern.
Pen holder, B. H. Barnes ... 432,355
Perfume holder, H. Tappan ... 432,451
Pin fastening, F. H. De Long ... 432,309
Pipe. See Bubble pipe.
Pipe covering, H. M. Hanmore ... 432,102
Pipe cutting apparatus, S. P. Denison ... 432,480
Pipe joint, G. O. Rinman ... 432,248
Pill machine, A. G. Wright ... 432,502
Pillow sham holder, F. E. Clark ... 432,361
Pipe wrench, P. H. Quinlan ... 432,079
Piston engine, angle, R. C. Berry ... 432,359
Planter, corn, H. Staggs ... 432,448
Plow, S. H. Walton ... 432,103
Pocket frame, A. Bernowitz ... 432,294
Pool table, W. H. Violett ... 432,458
Preserving milk, F. McIntyre ... 432,326
Press. See Cider press. Printing press.
Printing machine, Barker & Sproule ... 432,257
Printing machine, W. P. Kidder ... 432,413
Printing machines, preventing offset in, H. A. W. Wood ... 432,269
Printing press, J. F. W. Dorman ... 432,382
Printing press, D. I. Eckerson ... 432,385
Printing press delivery apparatus, S. G. Goss, 432,035, 432,036
Privy, Wharton & Nails ... 432,461
Propeller, buoyant screw, Smith & Horen ... 432,335
Protector. See Brick protector. Flue protector. Wagon reach protector.
Pruning implement, F. & F. C. Gerlin ... 432,386
Pulley, sash, Heid & Stover ... 432,406
Pulp engine, G. W. Cressman ... 432,300
Pulp moulding machine, M. L. Deering ... 432,379
Pulp screen cleaner, O. G. Farrington ... 432,024
Pump, G. Montrichard ... 432,426
Pump, double-acting, J. M. Clark ... 432,373
Pump, rotary, E. F. Smith ... 432,216
Punching and shearing machine, combined, C. A. Anderson ... 432,108
Rack. See Hat and cloak rack.
Radiators, etc., ornamental guard for, J. H. White ... 432,172
Rail joint, R. N. Wald ... 432,101
Railway conduit, electric or cable, J. Lynch ... 432,416
Railway crossing, cable and street, J. Lamplugh .. 432,054
Railway, electric, R. M. Hunter ... 432,049
Railway signal, M. Wuerpel ... 432,469
Railway signal compensator, W. W. Christie ... 432,155
Railway spike, E. Wolfgram ... 432,251
Railway switch, electric, W. D. Swart ... 432,095
Railway switch stand and signal, M. Wuerpel ... 432,308
Railway tie, metallic, E. Dainty ... 432,377
Railway track, P. H. Dudley ... 432,189
Railways, portable crossover for, Angerer & Pallander ... 432,292
Rake. See Horse rake. Lawn rake.
Range door, W. W. Goodwin ... 432,207
Recorder. See Cash drawer recorder.
Reel. See Harvester reel. Hose reel.
Reel for offset webs, Fowler & Henkle ... 432,233
Refrigerator, J. F. Hanrahan ... 432,134
Register for engines or machines, R. Ruhiman ... 432,441
Regulator. See Current regulator.
Revolver, Carter & Whiting ... 432,368, 432,369
Rings, forming, Bowden & Bernhardt ... 432,365
Rivet, J. L. Thomson ... 432,498
Rivet setting machine, H. H. Cummings ... 432,231
Rivets, making, J. J. Unbehend ... 432,490
Rolling seamless tubes, machine for, L. White ... 432,464
Roofing, sheet metal, W. Batdorff ... 432,176
Rubber shoe, C. Schummel ... 432,149
Saccharification of amylaceous substances, acid, A. H. J. Berge ... 432,293
Sad iron, G. F. Hardinge ... 432,389
Sale apparatus, automatic, G. A. Sinsel ... 432,333
Sand band, J. Van Curen ... 432,217
Sash balance, S. Jenkinson ... 432,137
Sash fastener, G. H. Fussett ... 432,390
Saw filing and setting machine, W. A. Timberman ... 432,455
Sawmill feed, H. Segur ... 432,444
Saw, portable, W. F. Stanley ... 432,337
Sausage stuffing machines, device for drawing sausage casings upon the nozzles of, F. W. Wilder ... 432,173
Screen. See Heat screen.
Screw cutting machine, H. G. Cooke ... 432,262
Screw swaging machine, W. T. McGinnis ... 432,154
Separator. See Grain separator.
Sewing machine, J. Stewart, Jr ... 432,449
Sewing machine shuttle, J. E. Bertrand ... 432,010
Sewing machine, sole, J. E. Bertrand ... 432,011
Sewing machine thread tension device, J. E. Bertrand ... 432,012
Sewing machines, guide for straw braid, J. E. Reynolds ... 432,389
Shaft coupling, D. Boorman ... 432,364
Shaft hanger, A. D. Cox ... 432,157
Shafting, machine for polishing, W. J. Manchester ... 432,144

Shaking apparatus, S. T. Jull 432,241
Shears. See Animal shears.
Shelving for stoves, movable, O. P. Thomas 432,506
Shingle sawing machines, feeding mechanism for, P. Pierson 432,071
Shoe last, B. Thorner 432 454
Shovels, making, L. Rowland 432,331
Sifter, ash, T. W. McKeever 432,165
Signal. See Railway signal.
Sleigh runner for wheeled vehicles, T. T. Rogers. 432,393
Smoke consumer, J. Conrad 432,018
Snow guard, Houghton & Barker 432,408
Spade, J. Ballard 432,472
Spinning machines, device for operating yarn separators in, Judge & Sullivan 432,301
Spinning mules, mechanism for operating the twist slides of, J. Bond 432,013
Spools or bobbins, machine for moulding, A. Hackett 432,017
Spring. See Coiled steel spring. Door spring.
Sprinkler. See Automatic sprinkler.
Stand. See Camera stand. Railway switch stand.
Steam generator, T. Prescard 432,075
Steam motor, J. H. Fedeler 432,101
Steam trap, W. E. Hall 432,360
Stereotype plates, machine for sawing, C. E. Hopkins 432,407
Stone sawing machine, J. H. Frenier 432,103
Stove, petroleum, O. Proust 432,498
Stump extractor, J. F. Smith 432,004
Sucker rod elevator, S. Potterf 432,193
Switch. See Electric switch. Railway switch.
Syringe, H. Basler 432,395
Table. See Folding table. Form table. Pool table.
Table, G. Beck 432,456
Telegraph, printing, W. W. Taylor 432,451
Telegraphic relay, J. M. Treber 432,008
Thill coupling, A. Armstrong 432,174
Thill coupling, H. F. McKnight 432,064
Tie. See Railway tie.
Tile, concrete illuminating, T. Sharts 432,349
Tiles, die for forming roofing, J. E. Donaldson 432,122
Toboggan, trolley, D. M. Harman 432,371
Tongs, pipe, G. W. Bufford 432,196
Tongs, pipe welding, R. Neilson 432,211
Top or toy, spinning, J. J. Carr 432,476
Tool, combination, W. H. Musham 432,323
Tool handle, J. F. Sullivan 432,536
Torpedo, C. M. Bennett 432,259
Toy, C. W. Fishel 432,391
Toy, V. Lopez 432,316
Trace holder, spring, W. B. Silvers 432,250
Trap. See Animal trap. Steam trap.
Trolley, W. C. Miller 432,060
Trolling spoon, E. F. Pflueger 432,436
Trunk, barrel, S. B. Jones 432,136
Tubes, machine for forming seamless, L. White .. 432,463
Tubing, machine for corrugating wrought metal, J. F. Fife 432,102
Tubing, metal, C. Maschmeyer 432,059
Typewriting machine, W. Baker 432,154
Typewriting machine, W. J. Barron 432,230
Typewriting machine, G. C. Blickensderfer, 432,256, 432,257
Typewriting machine, L. Dart 432,479
Typewriting machine, F. Fell 432,025
Typewriting machines, paper carriage for, G. C. Blickensderfer 432,397
Typewriting machines, type wheel for, G. C. Blickensderfer 432,396
Umbrella, folding, F. Munson 432,494
Undershirt, J. C. Sanford 432,443
Upholsterer's web stretcher, W. E. Morton 432,438
Upper, R. Nagle 432,326
Urinal, P. White 432,465
Valve regulator, damper, A. V. Bay 432,294
Valve, safety, W. C. Walda 432,459
Valve, safety relief, A. D. Kilborn 432,140
Vapor burner, generating duplex, H. Ruppel 432,393
Vegetable black, E. A. De Lisle 432,056
Vehicle, electrically propelled, J. W. Henderson .. 432,367
Vehicle, electrically propelled, R. M. Hunter 432,116
Vehicle, heater, J. W. Everhart 432,360
Vehicle running gear, G. A. Stom 427,150
Vehicle, short turning, C. Comstock ..... 432,236 to 432,238
Vehicle spring check, J. L. Meeks 432,052
Vehicles, folding step for, W. A. Miller 432,434
Velocipede, W. H. Dillon 432,361
Velocipede, C. E. Duryea 432,124
Velocipede saddle, C. E. Duryea 432,125
Velocipede, F. & L. C. Hopkinson 432,312
Vending machine, H. D. Parsell 432,439
Ventilator. See Automatic ventilator.
Vessel, armored, G. Meacom 432,061
Vinegar making apparatus, Murphy & Berkel 432,190
Wagon frame, D. S. Tuthill 432,543
Wagon reach protector, Sangmap & Hansen 432,064
Walls and ceilings, producing fireproof, C. F. W. Dohring 432,033
Warning machines, electric stop motion for, J. P. Haslam 432,040
Wash boiler, M. L. W. Martinot 432,419
Washing machine, W. H. Glastrap 432,133
Washing machine, J. L. Ridings 432,032
Watch movement, interchangeable stem winding, H. Abbott 432,256, 432,260
Water closet hoppers and pipes, coupling for, E. T. & F. S. Mathews 432,310
Water wheel governor, A. W. & E. E. Woodward. 432,105
Watering device, animal, A. C. Quade, Jr. 432,079
Web fabrics, apparatus for manufacturing, B. Dick 432,205
Welding compound, Straut & Shute 432,407
Whetstone for animal clippers, C. M. Palmer 432,431
Whip, H. T. Gowdy 432,466
Windmill, O. W. Parker 432,146
Windmill, E. Peck 432,435
Windmill attachment, T. Annis 432,110
Wire drawing die, B. Hadfield 432,236
Wire floor mat, coiled, T. W. Klipfel 432,244
Wire netting machine, E. S. Bond 432,253
Wire rope transmission, self-loading mechanism for, B. McIntire 432,191
Wire tightener, W. N. Bellah 432,221
Wire with metal, covering, T. B. Dooley 432,196
Wood filler, B. J. Conlig 432,119
Wrench. See Pipe wrench.
Wrench, J. Hail 425,469
Wringer. See Clothes wringer.

DESIGNS.

Album leaf, W. C. Horn 30,015
Bottle, C. E. Bentley ..... 30,028 to 30,032
Brooch, E. P. Beach 30,030, 30,039
Brush back, H. Berry 30,013, 30,014
Brush back, S. C. Howard 30,016
Carpet, W. L. Jacobs 30,029
Carriage body, W. T. Fost 30,037
Carriage body, J. C. Smith 30,041
Comb handle, H. Berry 30,011, 30,040
Corset clasp, H. Mathieu 30,033
Fireplace, F. W. Keifel, Jr. 30,038
Flower pot, J. G. Whildin 30,034
Glassware, ornamentation of, L. B. Martin 30,018
Hammer, D. L. Meirin 30,017
Hat rack, G. Merkel 30,024
Jewel setting, N. L. Ripley 30,035
Knobs and locks, escutcheon plate for door, G. S. Barkentin 30,005, 30,006
Padlock, M. Jackson 30,026
Pen holder, G. W. Mabie 30,040
Quilting fabric, C. Schulze 30,019
Scale weigh beam standard, H. G. Bauckmann 30,022
Scarf fastener, H. Berliner 30,010
Statue, W. Tweeddale 30,020, 30,021
Toy savings bank, P. Adams 30,007

TRADE MARKS.

Beverages, carbonated (aerated), W. F. Rosson 18,180
Blacking, liquid and paste stove, S. S. Jewett & Co 18,179
Clothing, leather and canvas, Dunlap, Lawton & Hall 18,195
Cotton and wool fabrics, Bullene, Moore, Emery & Co 18,173
Lager beer, G. Ringler & Company 18,178
Liqueurs, Rheinstrom Brothers 18,187
Medical remedies, certain named, E. Schmidt & Co 18,186
Paints, C. T. Raynolds & Co 18,172
Paper, linen, J. B. Price 18,167
Pickles, W. Lasenby 18,176
Plaster, rheumatic and strengthening, C. Wright Medicine Company 18,184
Prophylactic for use in microbian diseases, H. E. Woodward 18,180
Rubber combs, Harburger Gummi-Kamm Co 18,170
Sirup, rheumatic, C. Wright Medicine Company 18,169
Soap, laundry, Jimenez, Haustedt & Co 18,175
Suspenders and braces, Wire Buckle Suspender Co 18,191
Toys for producing effects for optical illusions, M. Bradley Company 18,182
Twist drills, T. Hooker 18,196
Watch cases, Essex Watch Case Company 18,174, 18,198
Watch insulator, Metropolitan Watch Company ... 18,171
Whisky, H. A. Dickinson & Co 18,193
Whisky, A. E. Norris 18,177
Whisky, C. M. Roof 18,168

A printed copy of the specification and drawing of any patent in the foregoing list will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

THE Scientific American

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete List of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers, and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies 10 cents. Address and remit by postal order, express money order, or check.
MUNN & Co., 361 Broadway, N. Y.
Publishers SCIENTIFIC AMERICAN.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.